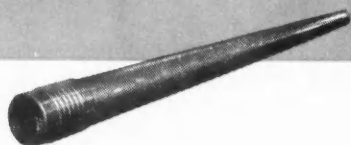


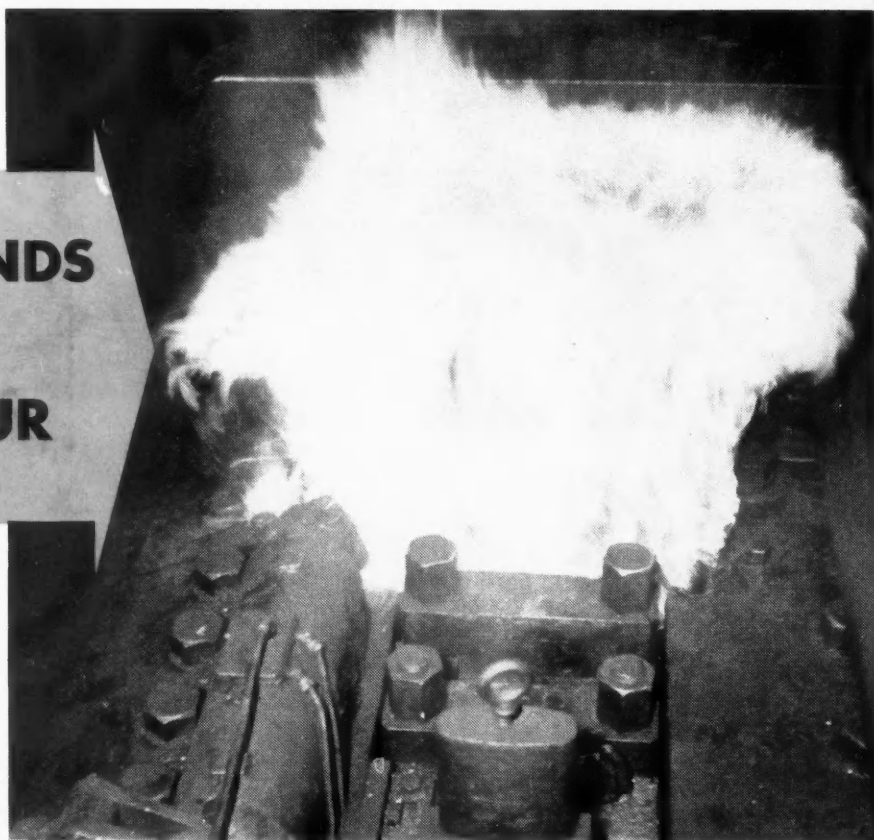
# AUTOMOTIVE *and Aviation* INDUSTRIES

SEPTEMBER 15, 1943

## THE FIVE SECONDS THAT SAVE HALF AN HOUR



Timken makes heavy  
gun tubes from Seam-  
less Steel Tubing



*Time was already of  
the essence...*

*Solemnly, we had promised to be-  
come the "arsenal of democracy"  
...to arm our friends against our  
mortal enemies.*

*And we had to HURRY, HURRY.*

*But now the Japanese had poured  
their fury upon Pearl Harbor and  
it was no longer a matter of "cash  
and carry" or lend-lease or frontiers  
on the Rhine. American men and  
women and materials had to DO*

*more and do it faster, better, than  
it had ever been done before.*

*American lives — AMERICA'S  
LIFE — depended on it.*

The sheet of flame in the above picture is but one step in a secret process developed by The Timken Roller Bearing Company by which heavy gun tubes are made from Timken Seamless Steel Tubing—at almost incredible savings of time and steel. The breech end of a 75 mm gun tube is being forged in five seconds... an operation that

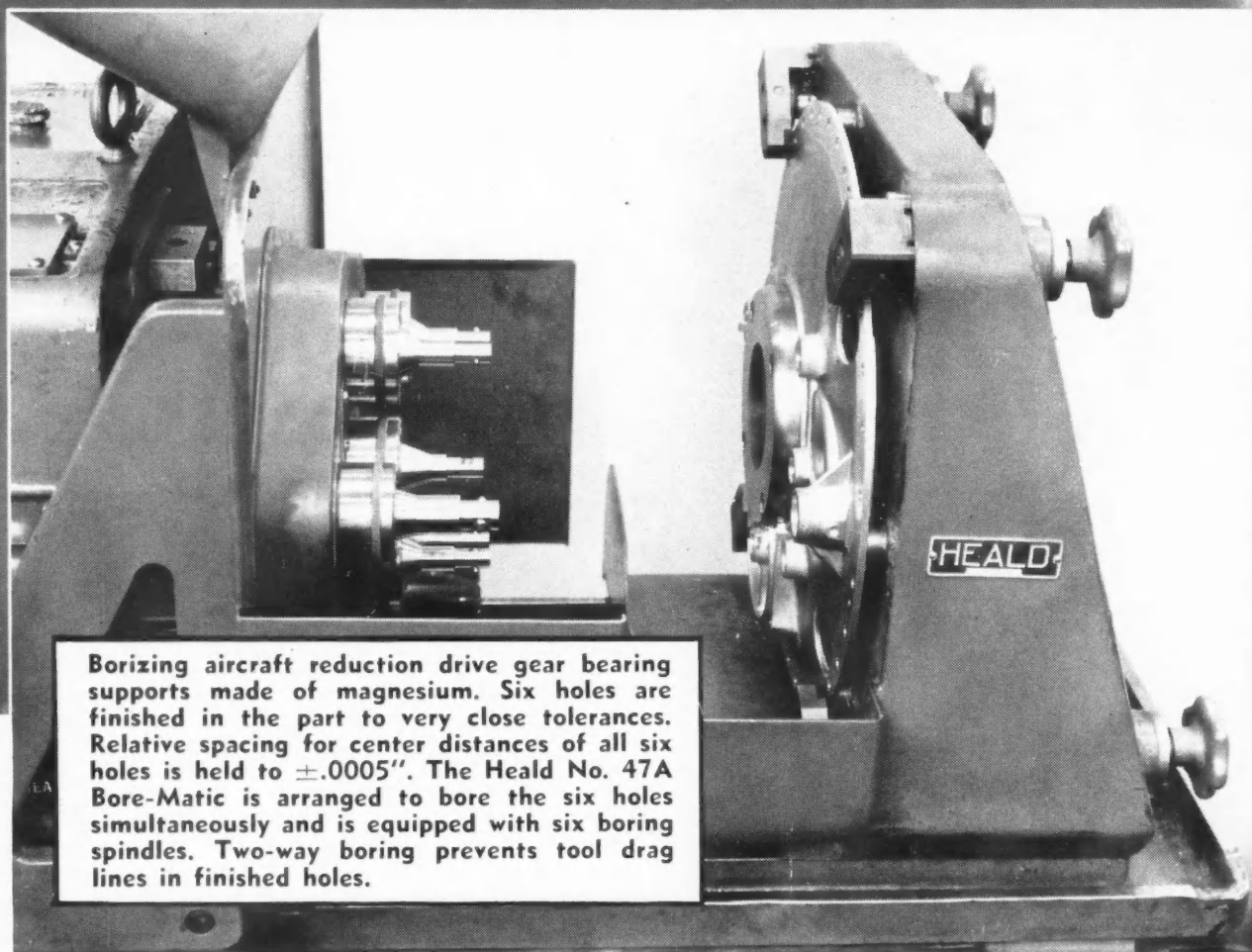
once required half an hour of vital time, made much scrap of scarce alloy steel.

The flame is one that leaps up many thousand times a month, one that will continue to leap up as often as the need may be, until the war is won. The Timken Roller Bearing Company, Canton, Ohio.

**TIMKEN**  
TRADE MARK REG. U. S. PAT. OFF.  
**SEAMLESS STEEL TUBES**

# The Solution

TO MACHINING POST-WAR LIGHT-METALS...



Borizing aircraft reduction drive gear bearing supports made of magnesium. Six holes are finished in the part to very close tolerances. Relative spacing for center distances of all six holes is held to  $\pm .0005''$ . The Heald No. 47A Bore-Matic is arranged to bore the six holes simultaneously and is equipped with six boring spindles. Two-way boring prevents tool drag lines in finished holes.

## Today's precision **BORIZING** of Aircraft Parts

In aircraft plants, everywhere, Heald Bore-Matics are boring, turning, facing and grooving hundreds of light metal parts to precision tolerances . . . with a finish measured in micro-inches. The same Heald "know-how" that gave the aircraft industry precision finished at mass production speeds will give post-war manufacturers maximum precision and production in machining light metal alloys.

The same engineering organization that designed and developed means and methods for accomplishing the impossible on complicated war time products are available to you for today or tomorrow's problems. Make this department part of your organization.

The Heald Machine Company Worcester, Mass., U.S.A

### Partial List of BORIZED Parts

Bases	Magneto
Bearing	Housings
Housings	Oil Pump
Camshaft	Bodies
Housings	Propeller Shaft
Covers	Plugs
Cylinder Heads	Reduction Gear
Crankcase	Cases
Sections	Regulator
Front Covers	Housings
Gear Boxes	Speed Reducer
Gun Turret	Housings
Saddles	Supercharger
Gyro Pilot	Gear Casings
Servo Bodies	Valve Housings
Instrument	Valve Tappet
End Shields	Guides

For More Precision Faster bring your problems to Heald



# AUTOMOTIVE and Aviation INDUSTRIES

Vol. 89

Published Semi-Monthly  
September 15, 1943

Number 6

JULIAN CHASE, Directing Editor  
J. R. CUSTER, Associate Editor  
JOS. GESCHELIN, Detroit Editor  
JEROME H. FARRIS, Ass't Editor  
E. L. WARNER, JR., Associate Editor  
MARCUS AINSWORTH, Statistician  
H. H. ROBERTS, Ass't Editor  
L. W. MOFFETT, Washington News Ed.  
HOWARD KOHLBRENNER, Art Editor  
R. RAYMOND KAY, West Coast  
J. DONALD BROWNE, Washington News Ed.  
MARCUS W. BOURDON, British

## CONTENTS

The Aircraft Industry's Problem of Reserves for Postwar Transition. By Francis A. Callery .....	17
Chemical Surface Treatment for Steel. By F. Carl Hirdler, Jr. ....	18
German Military Tractor with Motorcycle Steering .....	21
Mass Production Methods Used at Bell Plant to Build Airacobras. By Joseph Geschelin .....	22
Airbriefs .....	27
Possibilities of Furnace Brazing in Aircraft Production. By H. D. Samuel, Jr. ....	28
Short Cuts .....	30
Airspeed Horsa .....	32
Two New Consolidated Vultee Developments .....	34
All Half-Trac Assembly Operations at the White Plant on Mass Production Basis. By Joseph Geschelin .....	36
Kolene Metal Cleaning and "Tinning" Process for Bearings .....	40
New Products for Aircraft .....	42
New Production Equipment .....	44
News of the Industry .....	48
Hydraulic Valve Lifter on M-M Tractor Engine .....	60
New Products .....	62
Calendar of Coming Events .....	69
Advertisers' Index .....	172

## Automotive Division

Jos. S. HILDRETH, President and Manager

JULIAN CHASE, Vice Pres.

G. C. BUZBY, Vice Pres.

## OFFICES

Philadelphia 39, Pa., Chestnut & 56th Sts., Phone Sherwood 1424  
New York 17, N. Y., 100 East 42nd St., Phone Murray Hill 5-8600;  
Chicago 1, Ill., Room 916 London Guarantee & Accident Building, Phone Franklin 4243; Detroit 2, Mich., 1015 Stephenson Bldg., Phone Madison 2020; Cleveland 14, Ohio, 609 Guardian Bldg., Phone Cherry 4188; Washington 4, D. C., 1061 National Press Bldg., Phone District 6877; San Francisco 5, Calif., 605 Market St., Room 708, Phone Douglas 0967; Los Angeles 1, Calif., 6000 Miramonte Blvd., Phone Lafayette 5525.  
Cable Address: .....Autoland, Philadelphia

Member of the Audit Bureau of Circulations  
Member Associated Business Papers, Inc.

AUTOMOTIVE and AVIATION INDUSTRIES is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by  
CHILTON COMPANY  
(Incorporated)

## Executive Offices

Chestnut and 56th Streets, Philadelphia 39, Pa., U. S. A.

Officers and Directors

C. A. MUSSELMAN, President

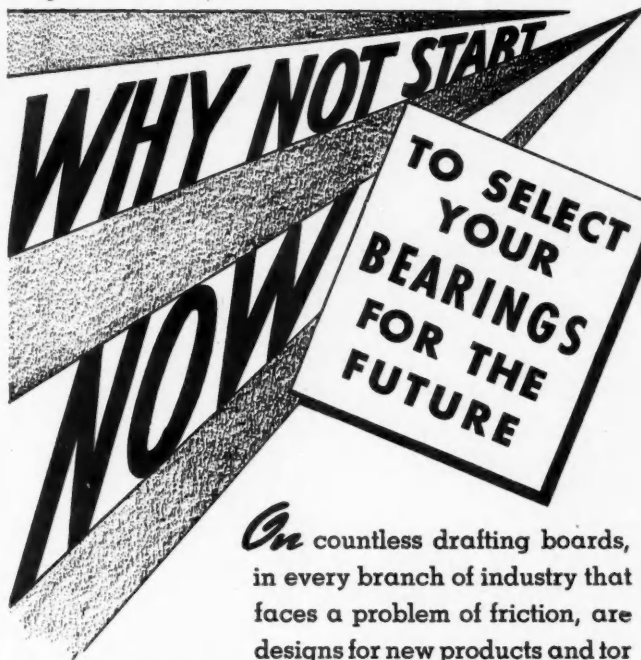
Vice-Presidents

JOS. S. HILDRETH  
EVERETT B. TERHUNE  
WILLIAM A. BARBER, Treasurer  
JULIAN CHASE  
P. M. FAHRENDORF  
J. H. VAN DEVENTER  
JOHN BLAIR MOFFETT, Secretary  
THOMAS L. KANE  
HARRY V. DUFFY  
GEORGE H. GRIFFITHS  
C. S. BAUR  
G. C. BUZBY  
CHARLES J. HEALE

September 15, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

AUTOMOTIVE and AVIATION INDUSTRIES, Vol. 89, No. 6. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign \$2.00 per year; single copies, 25 cents. except Statistical Issue (Mar. 15, 1943), 50 cents.



On countless drafting boards, in every branch of industry that faces a problem of friction, are designs for new products and for modernizing present products — worked out with the help of Ahlberg Engineering Service.

In this way many alert executives are using Today to prepare for Tomorrow.

You too can do that—can utilize these three conspicuous practical advantages of Ahlberg Service, in your planning for post-war business:

- ★ A wealth of experience representing every conceivable kind of anti-friction installation.
- ★ A complete line of bearing types to implement that experience.
- ★ 26 factory branches to make that experience quickly available to you—without cost or obligation.

It is good patriotism and good business to "select your bearings for the future"—and Now is the time. A wise first step is to write Ahlberg.



**AHLBERG**  
BEARING COMPANY  
Manufacturers of CJB Master Ball Bearings  
3002 West 47th STREET • CHICAGO, ILL.  
Cable West 47th PRECISION BEARINGS, INC. Los Angeles



# LET HYDRAULICS

## SOLVE YOUR REMOTE CONTROL PROBLEMS!

Sperry's EXACTOR HYDRAULIC CONTROL, by means of a flexible, unique, single-tube system, has solved **hundreds** of remote control problems for design engineers in many industries.

With over 60,000 units now installed on marine, aviation, and general industrial equipment geared to war's demands for dependable, maintenance-free operation, the EXACTOR HYDRAULIC CONTROL is saving thousands of dollars and hundreds of engineering-hours for many of America's top-notch designers in these fields.

Accurate and self-contained, requiring no special engineering to install or maintain, the EXACTOR HYDRAULIC CONTROL is well worth investigating if **you** have a control problem involving the accurate transmission of applied motion over distances up to 200 feet.

Sperry's EXACTOR HYDRAULIC CONTROL is rated at 100 inch-pounds torque in either direction or as high as 400 inch-pounds in one direction.



HOBOKEN • NEW JERSEY

FILL OUT AND MAIL COUPON BELOW. NO OBLIGATION!

**SPERRY PRODUCTS, HOBOKEN, NEW JERSEY**

**Gentlemen:**

Please send me, at no cost, a copy of your Bulletin 78-D containing complete details on your EXACTOR HYDRAULIC CONTROL.

NAME..... TITLE.....

COMPANY.....

ADDRESS..... CITY..... STATE.....







# **AUTOMOTIVE and AVIATION INDUSTRIES**

Volume 89 September 15, 1943 No. 6

## **AUTOMOTIVE INDUSTRIES**

Reg. U. S. Pat. Off.

### **Manpower Stabilization**

A Conference on Manpower Stabilization will be sponsored by the Personnel Division of the American Management Association, September 28, 29, and 30 at the Hotel Pennsylvania, New York City. Top officials of the War Manpower Commission and the War Labor Board will address the sessions which are expected to draw an attendance of 2,000 industrial executives from all sections of the country.

Sessions have been planned under the direction of Lawrence A. Appley, Vice President of the Association's Personnel Division and Deputy Commissioner and Executive Director of the War Manpower Commission. Mr. Appley will speak at one the feature sessions of the Conference, in company with such other war manpower figures as Major General Lewis B. Hershey, Director of the Bureau of Selective Service; Mrs. Anna Rosenberg, War Manpower Commission Director of Region II; and other industrial members of the Commission's national organizations.

Among other speakers will be George W. Taylor, Vice Chairman of the War Labor Board; Eric A. Johnston, President of the Chamber of Commerce of the U. S.; Paul Hoffman, President of the Committee for Economic Development, and President of the Studebaker Corp.

Make Every Pay Day

### **"BOND DAY"**

Get back of the Pay-Roll Savings Plan by encouraging employees to turn part of their earnings regularly into tanks and planes and guns through systematic purchase of

## **U.S. WAR BONDS**

### **Reserves for Postwar Transition**

17

The aircraft industry will be facing a real problem at the end of the war. Their financial structure and general management will need someone to pull rabbits out of hats for them if the industry is to reach the high place in the affairs of our lives that is expected of it. Here is an analysis of the situation that brings out points not generally realized.

### **Chemical Surface Treatment for Steel**

18

The title tells the story except the fact that the data is right from the "front lines" and the author can speak with authority.

### **German Military Tractor with Motorcycle Steering**

21

The Germans have created a most unique conveyance for the war front. It is described and illustrated in this article and is of unusual interest.

### **Furnace Brazing in Aircraft Production**

28

The how, the when, the where and the why of this method of production is fully explained in this treatise on furnace brazing. To be well informed you must read it.

### **The Airspeed Horsa**

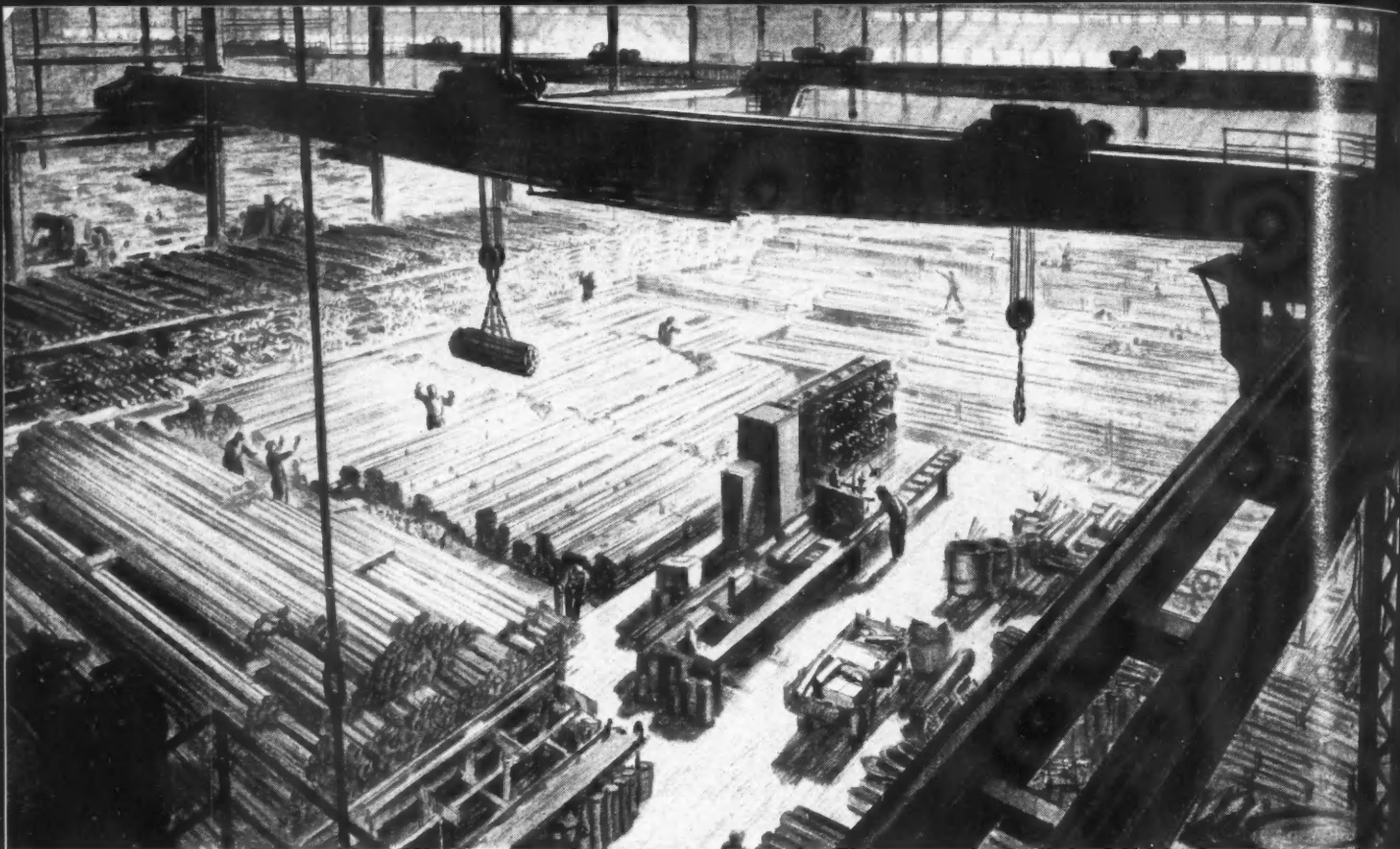
32

Here are two pages of detail illustrations of this large transport glider being used by the British forces.

### **Half-Trac Assembly Operations on Mass Production Basis**

36

The cooperation of the Army Ordnance and the truck manufacturers of the country have accomplished wonders in the production of the half-trac for the war. What has been done and how it has been done is a story of more than usual interest.



## **STEEL—In Ryerson Stock** *for Immediate Shipment*

Pictured above are steel stocks in one of the ten Ryerson plants. Ready for immediate shipment are thousands of kinds, shapes, and sizes of steel to fill the requirements of war industries and the manufacturers of essential civilian goods.

Rush orders, equipment breakdowns as well as the normal demand for small lots of steel make it highly important to have a source ready with the right steel to meet all emergencies.

The ten Ryerson Steel-Service plants are geared for just this operation. The steel carried in Ryerson stock makes it practical for manufacturers to reduce high inventories—eliminate idle steel and make every ton work for victory. Call your nearest Ryerson plant when you need steel.

**JOSEPH T. RYERSON & SON, INC.**

Plants at: Chicago, Milwaukee, St. Louis, Detroit, Cincinnati,  
Cleveland, Buffalo, Boston, Philadelphia, Jersey City

# **RYERSON STEEL—SERVICE**

A  
The  
Pro  
By  
M  
the  
a he  
publ  
imm  
men  
avia  
insta  
buil  
just  
H  
stoc  
ited  
now  
Har  
for  
Con  
tin,  
In  
thes  
high  
\$42  
so  
The  
Sep



## The Aircraft Industry's Problem of

# Reserves for Postwar Transition

By Francis A. Callery

Vice President in charge of Finance,  
Consolidated Vultee Aircraft Corp.

**M**UCH has been published to show the American people the magnificent things that aviation can do postwar. Little has yet been said about the fact that these things cannot come to pass, unless a healthy aviation industry survives. Hence a wide public understanding is needed for some of today's immediate problems facing the industry's management. And some questions should be answered. Is the aviation industry earning excessive war profits, for instance? Is it making its stockholders rich? Is it building up reserves for the days when it must readjust itself to a peacetime basis?

Here are some facts of present moment. First, stockholders of the aircraft companies have not profited from the war. In fact, they are not as well off now as they were a year or so before Pearl Harbor. This can be shown by some figures for six large airframe manufacturers—Boeing, Consolidated Vultee, Douglas, Lockheed, Martin, and North American.

In 1939 the average price of the shares of these six companies ranged between \$41.70 high and \$22.81 low. In 1940, the high was \$42.97 and the low \$25.72. In 1943, the range so far has been \$29.97 high and \$21.91 low. The present average price is approximately

\$24.90. It is clear that stockholders have not profited through any increased market value of shares.

Have they, then, profited through dividends? Well, the average dividend of the six companies was \$1.06 per share in 1939; \$1.96 in 1940; \$2.79 in 1941; and down to \$1.96 again in 1942. Present dividend payments are no higher than in 1940. And, as shown above, there have been no market profits. Dividends and increase in values of stock are the only two ways by which stockholders can benefit. The aircraft stockholders have not benefited by either.

Nor, it may be remarked, have stockholders profited by the large investments made by Government to expand aircraft manufacturing facilities. Consolidated earned \$8,000,000, for instance, in 1941 without such Government facilities; it earned \$9,000,000 in 1942 when using such Government facilities as the new \$22,000,000 parts plant at San Diego. The money the Government has poured into aircraft has not gone to the stockholders at all.

It can be pointed out, however, that reported earnings on the average have gone up during this period, from \$1.83 per share in 1939 to \$5.00 in 1940, to \$9.61 in 1941, and to \$12.18 in 1942. This seems fantastic. It is. The profits as shown are merely bookkeeping

(Turn to page 110, please)

THE Economic Development Committee of the Aeronautical Chamber of Commerce of the United States will hold its first conference Sept. 20-22 at Colorado Springs, during which basic problems now confronting the aircraft manufacturing industry will be studied by representatives from a large number of companies. Among the topics on the program are domestic and foreign trade developments, disposition of defense plants and equipment, renegotiation of Government contracts and allowance for reserves for reconversion, release of engineering facilities for development of projects, and termination of war contracts.



# Chemical

*Aircraft steel parts are being lowered into a hot alkaline solution at the Denman Rustproofing Co. for cleaning prior to oxide treatment. Then follows in successive tanks the operations—rinse, oxide processing (tanks No. 1 and 2), cold rinse, hot rinse, and oil dip.*

## Oxide Surface Coatings

The oxide method of surface treatment for steel consists of boiling the steel in a solution composed of water, sodium hydroxide, and various other chemicals, such as sodium nitrate, sodium nitrite, sodium chromate, etc. These other chemicals vary according to the exact proprietary compound being used. Most of the mixtures which will give pleasing results are patented and are put out under proprietary names. After the above treatment the parts are rinsed in water and oiled, usually with a soluble type oil. Due to the fact that large amounts of chemicals are dissolved in water to make up the solution,

the boiling point is quite high, usually in the neighborhood of 300 F. Operation of the tanks is fairly simple. Inexperienced operators may handle the whole procedure in most cases. The average setup will consist of a cleaning tank, rinse tank, hot solution tank, rinse tank, and oil tank. If badly rusted steel is to be processed, a pickle tank and a rinse should be provided. Certain of the proprietary processes recommend two processing tanks, to be used at different concentrations and temperatures. These are merely variations of the basic process.

It would seem that cleaning of parts prior to oxide treatment would not be too critical due to the caustic content of the treating bath. However, this is not true, especially in cases where it is necessary to remove both dirt and rust. The ordinary cleaning and rust removing cycle to be used prior to treating would be: cleaning by immersion in a tank of hot alkaline cleaner, hot water rinse, acid pickle, and rinse (separate rinse).

Acid pickling to remove rust and scale may also remove excessive amounts of steel unless an inhibited acid is used. Overpickling, and allowing the acid bath to become too contaminated with iron, may be causes

**V**ARIOUS types of coatings have found wide acceptance during past years for the rustproofing or ornamentation of iron and steel. Many new fields are continually being opened to them where they may be applied with great success. Probably the earliest method of blackening steel was heat-blackening. Of course, this may not be done where the temper of the metal is involved. In general, inorganic chemical surface treatments may be classified as oxide or phosphate types. Electroplating will not be included as a chemical treatment due to its electrical nature. Organic paint-type coatings will be discussed as secondary, rather than primary coatings.

It has long been known that steel may be blackened by chemical means. Several methods are in commercial practice today. Quite a few patents have been granted on this subject. Early gun blueing practices included both the browning or rusting treatment, and the copper oxidation treatment. In the first, the barrels were alternately rusted and partially polished until a fine, dense iron oxide surface structure was obtained. This structure could then be made somewhat corrosion-resistant by the absorption of oil or rust preventive compounds. In the second method, the barrels were first plated with copper, and then the copper was oxidized by chemical means. Neither of these treatments offers much in the way of rust resistance. As the coatings are somewhat porous, oil will remain in the pores longer than on bare steel, thus giving some added protection. In a salt spray, the bare, dry coatings are little better than bare, dry steel. So we might say that the major value of these coatings is ornamental rather than protective. These two types of coatings have been largely supplanted by the oxide types.

**By F. Carl Hirdler, Jr.**

Process Engineer, Turco Products, Inc.



# Surface Treatment for Steel

for the work to come out of the processing bath coated with a red or brown scum. More trouble will be experienced, when using this process, through improper rinsing than from any other cause.

It is to be pointed out that this solution is hard on hands and clothes, and parts should be completely rinsed so as to preclude possibility of harmful effects on materials with which they may come in contact in the future.

There are several advantages to this process. The film formed by this process is an iron oxide. It penetrates the metal surface only a few hundred-thousandths of an inch, and causes no dimensional build-up on parts. Thus no difficulties would be encountered with the use of this finish on threads and finely machined surfaces. The shiny blue-black film is also desirable from an ornamental standpoint. A high luster may be obtained if parts are polished prior to processing. A sandblasted surface will give a dull, black coating. Certain manufacturers of proprietary compounds for the oxide process advertise that the oiled coatings obtained by their process have good lubricating, or friction reducing properties. They also claim greater abrasion resistance on processed parts.

The main disadvantage of the oxide process lies in the poor corrosion resistance of the finished parts. When tested in a standard salt spray conforming to the Specification AN-QQ-S-91, bare panels last only two to five hours. Even oiled panels ordinarily show signs of rusting in less than 20 hours. Obviously, structural parts for aircraft processed in this manner could not be expected to stand up under severe service conditions. As an ornamental finish the oxide process is suitable provided that proper precautions are taken in preparing surfaces for treatment. All surface imperfections, machining marks, and scratches, will not only show in the finish, but will seemingly be magnified. Parts must be polished or buffed prior to processing if perfect surface finish is expected.

For the duration of the war, while Inconnel and stainless steels are

difficult if not impossible to obtain, the protection of the low-alloy substituted steels is an important problem. It is true that these low-alloy steels may be cadmium or zinc plated. Zinc is so extremely anodic to steel that in many instances it proves a poor protection, as it is so rapidly corroded. Cadmium, nickel, and copper, not only are cathodic to steel, but are even more critical at present than cadmium and zinc. These facts can be verified by reference to Tables 1 and 2. It is to be noted that materials close together (having practically the same potential) are not very reactive to one another, whereas those separated by a great distance in the table would be extremely reactive. As a result of this situation the phosphate, or second general type of chemical surface treatment for steel, is becoming more popular daily.

## Phosphate Coatings

Phosphate-type coatings for steel have been known since 1869, the date of issuance of the first patent on this subject. Since that time, over one hundred patents have been issued, covering various phases of this work. It is now possible, by varying certain factors such as cleaning, surface finish, type and concentration of solution, temperature, time of immersion, and after-treatment, to obtain phosphate coatings of varying thickness, porosity, and corrosion resistance. Due to the many different types and usages of low-alloyed steels, it is only fitting that protective coatings be developed to suit the various needs of industry. And we find that this is the present situation. (Next page.)

TABLE I

Anodic	2S						Cathodic
	Mg	52S	4S	3S	A17ST	17S	
				53S	Cad.	24S	
	Zn			Alclad	X-4130		
						Steel Chrome Plate 18-8 Stain	
						Brass Monel	

X-4130 may be variable and may at times act as ordinary steel.

Any material will be anodic in contact with any other materials shown in a column to the right in Table I, and will afford anodic protection to such materials.

The primary type of solution for applying these coatings to steel is composed mainly of the orthophosphates of iron and manganese, or of the orthophosphates of iron and zinc, together with free phosphoric acid. In some instances fluosilicic acid, or a soluble fluosilicate is added to impart additional corrosion resistance to the coating. Steel parts immersed in such a solution will receive a coating composed mainly of interlocking crystals of secondary and tertiary iron and manganese, or iron and zinc, phosphates. The exact chemistry of these reactions is not too well known, as several authorities on this subject are not in complete agreement. Various solutions are on the market today, under proprietary names, which are satisfactory for producing corrosion-resistant coatings on steel. It is to be understood that all the more advanced types are covered by recent patents.

In order to produce a reasonably satisfactory coating in a short period of time, modifications of the above described solutions have been developed which contain accelerators. Literature refers to both metallic copper and to nitrates for this purpose, but the weighted opinion seems to favor nitrates. By using proper proportions of accelerator and spraying the hot solution on the steel, it has been found that satisfactory coatings can, in certain instances, be obtained in from one to two minutes, instead of the 30 to 60 minutes required by the standard processes.

It is mandatory that parts being processed be free from dirt, grease, rust, and scale if best results are expected. Cleaning and rust removing are just as important prior to phosphate treatment as they are prior to oxide treatment. Although the phosphate process employs a solution containing some phosphoric acid which is a good rust remover, it has been found that castings with precorrosion resistance are obtained if rust is not removed prior to processing. The same cleaning and pickling methods may be employed as are described under the oxide process. However, different types of alkaline cleaners may cause coatings of different thicknesses to be produced in the phosphate bath. The use of a vapor degreaser instead of an alkaline cleaner may give a different thickness of coating. Experiments are under way at the present time to correlate these different thicknesses of coatings with the various cleaning procedures.

After treatment, parts should be given a thorough

rinse in hot water to remove solution and products of reaction. Due to the fact that it is almost impossible to completely rinse solutions from parts, even with running fresh water, it is recommended that parts be given a passivating treatment by dipping them, for about one minute, into a .5 to 1.0 per cent solution of chromic acid at a temperature of around 180-200 F, especially in the case of parts given the short-time treatment. This chromic acid materially increases corrosion resistance and neutralizes any active agents which were not removed by the hot water rinse. In addition, the heat will assist in the drying of the parts.

Steel so processed will usually have a gray surface, and will probably show brown or tan-colored streaks.

The streaks are chromic acid stains and do no harm. In fact, they usually add to the corrosion resistance and subsequent paint adhesion. This may be exemplified by the chromic acid dip, required by Army and Navy specifications, on parts after cadmium and zinc plating. This chromic acid dip neutralizes the cyanide and caustic on the parts, brightens them to some extent, and adds

materially to the corrosion resistance and subsequent paint adhesion. Even though a few hundred-thousandths of an inch of plating (or phosphate coating) are removed by the chromic acid, intensive investigation has shown that corrosion resistance is still greater than on untreated parts, and considerably greater than on parts given a nitric or sulphuric acid bright dip. It is common knowledge that alkalinity on the surface of any material greatly reduces the paint adhesion. In addition, unpainted parts contaminated with alkaline products on the surface may easily be the cause of corrosion to adjacent aluminum parts at a later date. For these reasons it is necessary that the chromic acid dip be the last operation, and that the chromic acid rinse be used for no other purpose. After drying parts may be dyed black with hot water soluble dye. This will not add appreciably to the corrosion resistance. Several companies offer black lacquer-type coatings which both dye and add to the corrosion resistance.

The new U. S. Army Specification 57-0-2B gives a table listing standard salt spray requirements to be met by the various finishes. The applicable salt spray specification is AN-QQ-S-91. Zinc-plated parts must not show failure after 48 hours in the spray. Dry

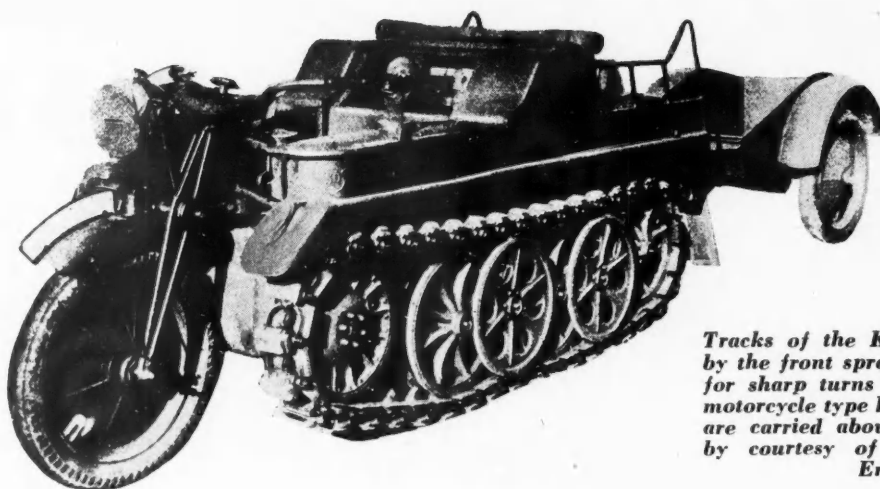
(Turn to page 84, please)

TABLE II

Negative potentials (in volts) as measured by a calomel half-cell using a normal NaCl plus 3 per cent hydrogen peroxide solution.

Magnesium Alloys	Magnesium	1.73	Aluminum Alloys	Cadmium	.82
	AM3S	1.71		36S-T4	.81
	AM57S	1.68		35S-T4	.78
	AM240-T4	1.66		A-17ST	.73
	Zinc	1.00		19S-T4	.70
	220-T4	.96		17ST	.68
	72SO	.96		24ST	.68
	214	.87		Mild Steel	.67
	56SO	.87		Lead	.55
	Pure Al (7A)	.85		Tin	.49
Aluminum Alloys	52SO	.85		Chrome Plate	.35
	2SO	.83		60-40 Brass	.28
	2SH	.83		Copper	.20
	3SO	.83		18-8 Stainless	.15
	3SH	.83		Monel	.10
	53SW	.83		Silver	.08
	53ST	.83		Nickel	.07
	61ST	.83		Inconel	.04
	43	.83			





*Tracks of the Kettenkrad are driven by the front sprockets and are braked for sharp turns by movement of the motorcycle type handlebars. Fuel tanks are carried above the tracks. (Photo by courtesy of Commercial Motor, England)*

**O**NE of the most unique military vehicles to appear in the present world war is the German Kettenkrad, a track-laying tractor-motorcycle combination which is said to have been developed by the makers of N.S.U. motorcycles at the request of the German Ordnance Corps. It is used for carrying dispatches where the going is hard, but is intended primarily for the towing of guns, ammunition trailers and supplies in general.

The engine is an Opel Olympia four-cylinder, water-cooled unit developing 36 bhp. Its displacement is 91.5 cu in. Power is transmitted to the tracks through a six-speed gear-box and bevel gear-differential to the front driving sprockets. The engine is located amidships, but the radiator is at the rear with a gear-driven fan, the speed of which can be varied by the driver irrespective of engine or vehicle speed. A remote thermometer is fitted in front of the driver. There is driver control also of a flap in the outlet fairing of the radiator to provide rapid warming up after a cold start.

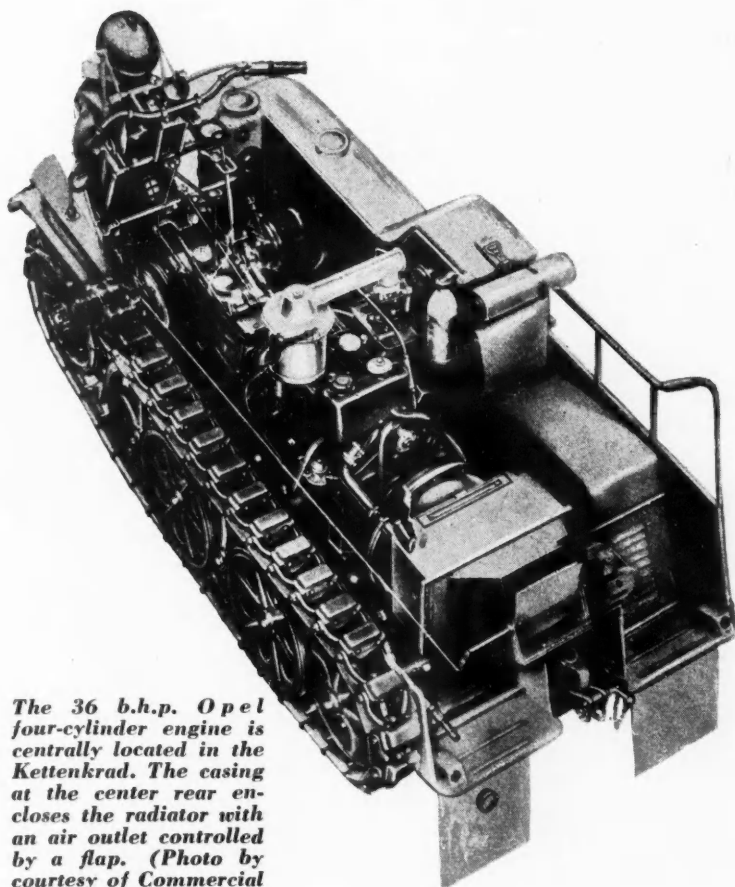
Track wheels and bogies are similar to those used on German tanks, being mounted on cranks and sprung by means of torsion bars. The chain track links are said to have needle roller bearings, with each pin provided with a positive lubrication system. The tracks themselves have rubber pads.

As regards performance, the vehicle (presumably without a loaded trailer attached) is stated to be capable of climbing a 90 per cent gradient where the surface is good, and a maximum speed of 50 mph on level ground. Gasoline consumption is reported to be 25 miles per U. S. gallon.

On good roads or any hard and smooth surface the Kettenkrad is steered by the

## German Military Tractor with Motorcycle Steering

single front wheel, but a sharp turn results in one track or the other being braked as in the case of a tank. By this means the vehicle can be turned in its own length, which is approximately 10 ft. high.



*The 36 b.h.p. Opel four-cylinder engine is centrally located in the Kettenkrad. The casing at the center rear encloses the radiator with an air outlet controlled by a flap. (Photo by courtesy of Commercial Motor, England)*

# Mass

**By  
Joseph  
Geschelin**



**T**HE deadly Airacobra—the Army's P-39—designed and produced by the Bell Aircraft Corp., marks an outstanding example of the applications of automotive mass-production methods in the manufacture of a high performance military airplane. The “flying cannon,” designed about its centrally mounted Allison liquid-cooled engine, is integrated from the activity of two separate plants. One of these is an artistically conceived modern layout which houses, primarily, the sub-assembly and final assembly of the airplane, the painting, and flight-testing of the airplane before delivery to the Army at its airport. The second plant, located in another community, is devoted largely to fabrication—press shops, machine shops, heat treating, metal treating, sub-assembly production, and assembly of wings.

*(Top of page) On the pre-flight line—the airacobra gets its wings. The wings are fabricated in the manufacturing plant, transported to assembly.*

*(Above center) Aeroprop and gear reducer are installed here, the assembly being dropped into place with the aid of an automatically-controlled hoist.*

*(Left bottom) On the fuselage line—the Allison engine becomes an integral part of the structure at this station.*

# Production *Methods Used at Bell Plant*

## *to Build* **Airacobras**

In addition to the manufacture of the Airacobra, Bell also serves as a sub-contractor to Boeing in the manufacture of fuselage sections for Flying Fortresses; and boasts an Ordnance Department which makes gun mounts of various types for the gamut of military airplanes. Bell Aircraft operations are so extensive, cover so amazing a variety of fabrication techniques, that we shall have to be content with but a high-spotting of certain of these activities, providing a more extensive visualization through the medium of carefully selected factory views in many corners.

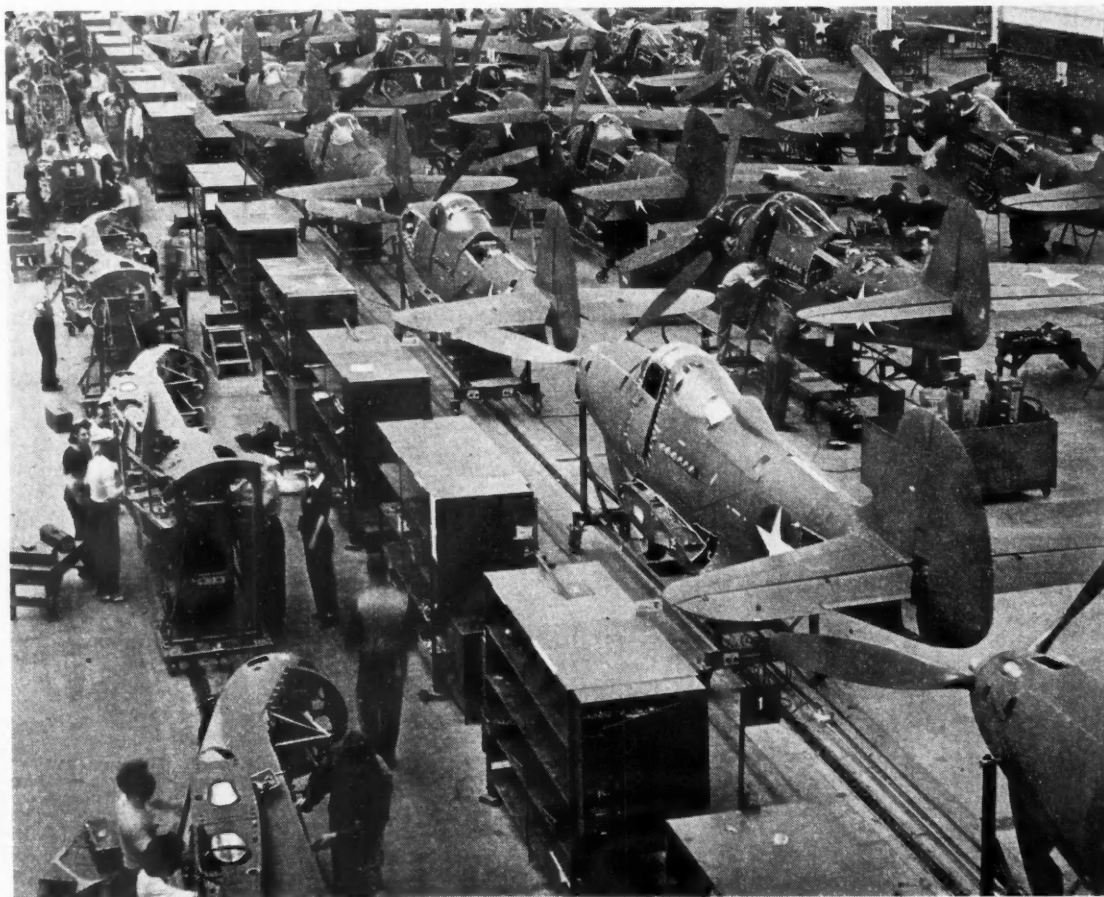
The airport plant is devoted to sub-assembly operations on the fuselage, the cabin, final assembly of the airplane, testing, and airport facilities. In addition,

there is a mezzanine area with departments for producing tubing assemblies, wiring harness, Plexiglas formation, etc.

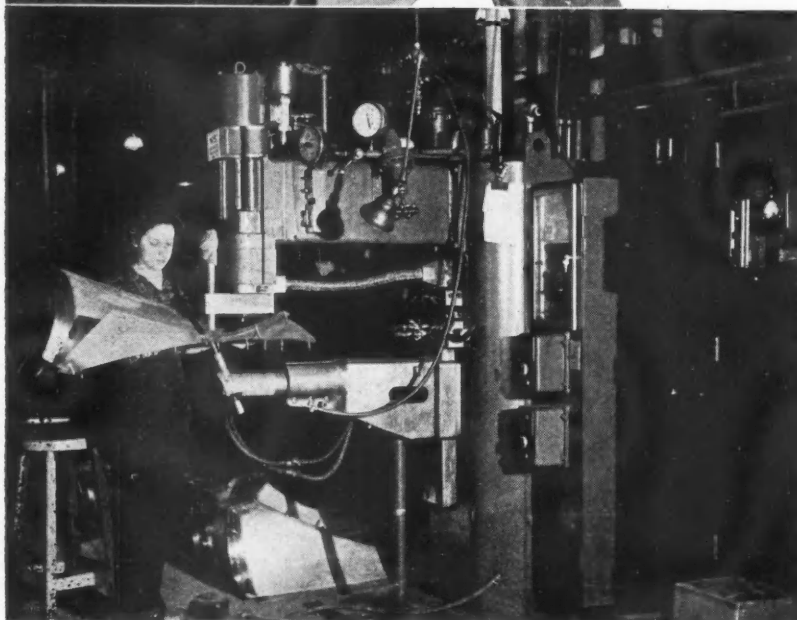
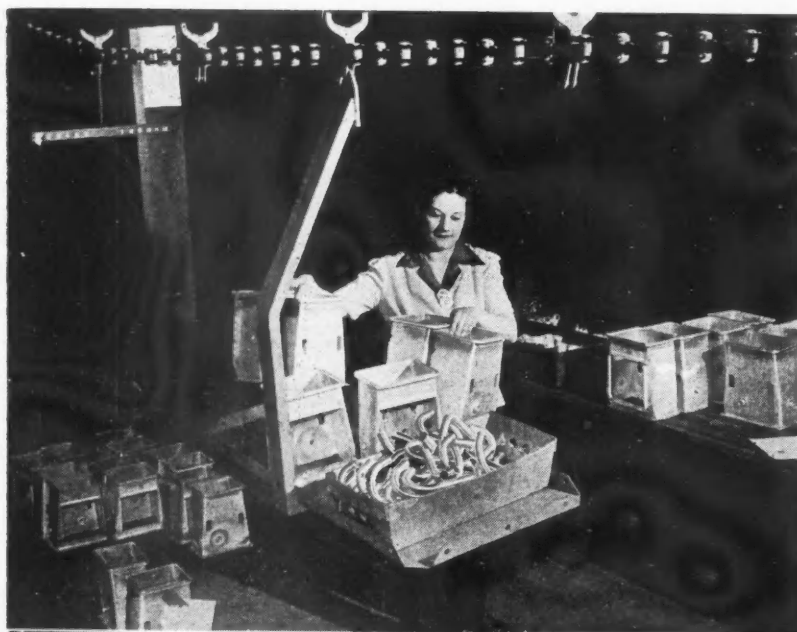
Outstanding feature of this plant is its mechanization—a series of drag chain assembly line conveyors for fuselage and airplane assembly, and two coordinated monorail conveyor systems for feeding parts and sub-assemblies to the assembly lines. In keeping with modern mass-production methods, sub-assembly stations are located at the side of principal assembly stations to facilitate materials handling and to effect a better coordination of tasks.

Among the latest installations of equipment in the assembly plant are—a comprehensive system of overhead

Assembly lines at Bell Aircraft Corporation, where Army P-39 Airacobras are built. Extreme left, early stages of fuselage assembly. Middle lines, the last stages of "cleanup." Far right, the beginning of the pre-flight line where Airacobra wings are attached. The "cleanup" lines move in opposite direction to the fuselage and "pre-flight" lines, which accounts for the fact the early stages of the fuselage and "pre-flight" lines are parallel with the final stages of "cleanup."







power-duct supplied by the National Electric Products Co., and a two-ton, refrigerated Cardox CO<sub>2</sub> fire protection unit for several record-keeping vaults.

From a production standpoint, the Bell Airacobra owes its success to the maximum utilization of the "lofting" system, in which literally thousands of steel templates are employed, thus eliminating the use of blue-prints in the preparation of the formed airframe parts. To further facilitate an orderly production process, the airframe has been broken down into major sections of most fundamental character. Some of these may be noted as follows:

- wing outer panels
- fore fuselage
- aft fuselage
- cabin
- horizontal stabilizer
- doors and panels
- fillet sections, and armament panels
- landing gear, etc.

The production scheduling problem may be visualized from the fact that the airframe takes some 9000 forged, cast, and sheet metal parts, requiring some 75,000 rivets for assembly, and over a mile of wiring and tubing harness.

Bell was among the first producers of military airplanes to mechanize its assembly operations, encompassing perhaps the first fully conveyorized fabrication and assembly lines for the wings. Between the two plants, Bell boasts some nine miles of conveyor lines, much of which was installed by Mechanical Handling Systems. Of this total, about 25,000 ft is found in the assembly plant; about 21,000 ft in the fabrication plant.

As in typical automotive practice, the conveyors provide the medium for

*(Top of page) Heart of materials control system is the Mechanical Handling systems monorail feeder conveyor, one of two lines in the assembly plant. Shown here is a dispatcher's station, one of many points at which the ceiling-height conveyor dips to floor level.*

*(Above center) Other spot welding operations are performed on Taylor-Winfield, Hi-Wave resistance welding machines.*

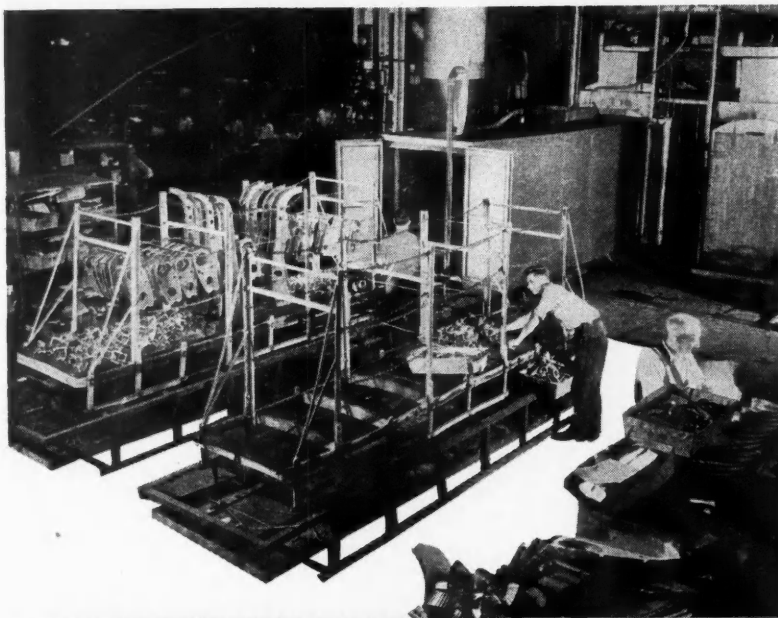
*(Left bottom) Cowling sections are spot welded on this Sciaky welder. The Mallory tips are water-cooled at a temperature of 37 F.*

scheduling the various assembly operations. In the assembly plant, there are two overhead feeder line conveyors—one system feeds the sub-assembly departments which serve the final assembly lines; the other distributes parts directly to the assembly lines.

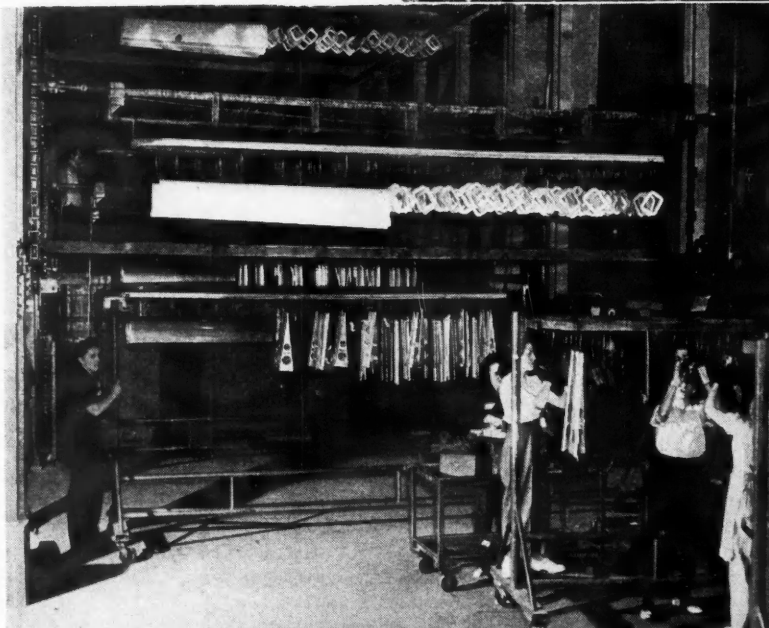
The outer conveyor system travels close to the ceiling for the most part, dipping to floor level only at loading and unloading stations. At these points the carrier is unloaded by a dispatcher and transported directly to the work station. The second conveyor system travels at ceiling height, traversing a long cat-walk gallery which communicates with a system of seven cross-wise cat-walks, covering every main assembly station on the floor. Dispatchers pick off the carriers consigned to their area, then move the carriers by hoist to the proper assembly station where the carrier is dropped to the floor from above.

In the fabrication plant, the conveyor system traverses practically every department, hauling parts, raw materials from the stock room, and parts from department to department.

Each carrier contains a number designating its destination, dispatchers at each station unloading or loading work according to instructions of the foreman. Each dispatcher has operation sheets which determine the department to which certain carriers are to be consigned. Control of this system of dispatching is exercised by messages sent through a pneumatic tube system, notifying Production



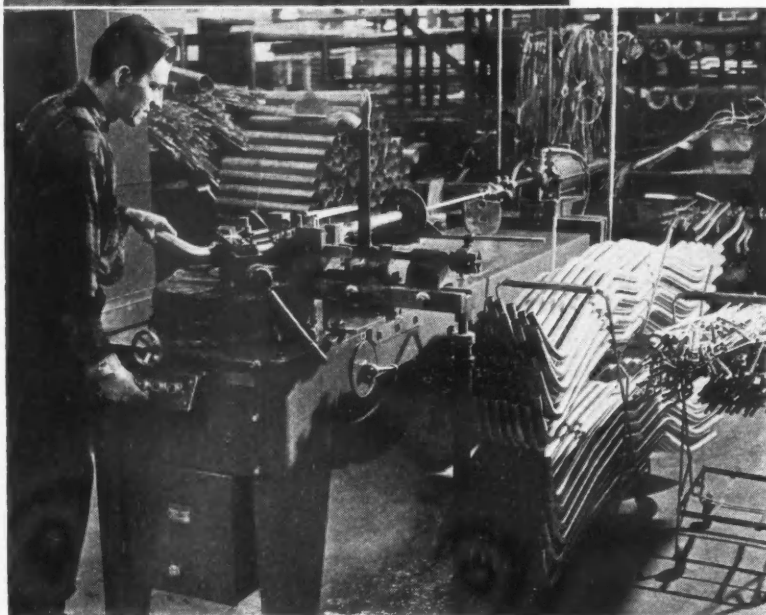
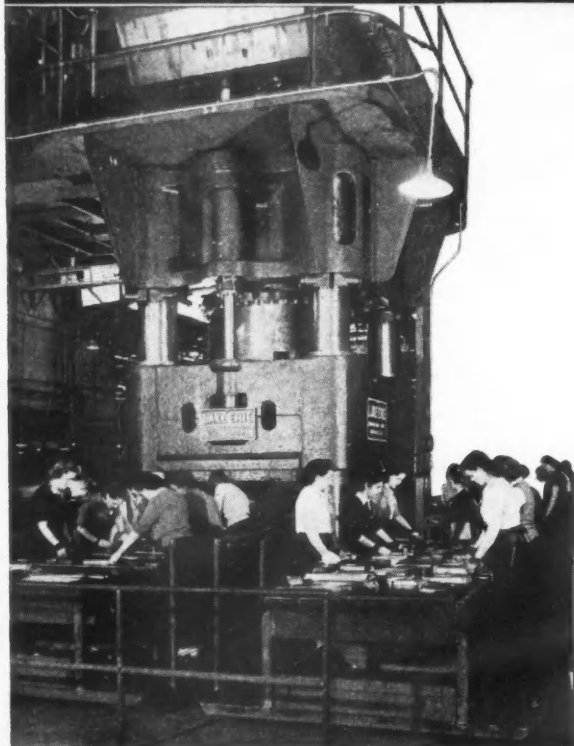
(Top of page) A battery of three Lindberg heat treating furnaces is used for the heating and quenching of formed aluminum alloy parts. This view shows a loaded rack ready to be rolled into a furnace.



(Above center) Entrance end of Hanson-VanWinkle-Munning Chromodizing machine, built to Bell specifications. In the foreground is the loading station, showing girls loading one of the screens. To the rear, one of the screens about to dip in the first of the tanks while above is a finish-painted screen coming in for unloading.



(Right bottom) Bullard-Dunn process machine, arranged in accordance with Bell procedures is employed for chemically cleaning aluminum parts in preparation for spot welding. A Detrex solvent degreasing machine is built into one of the stations. This equipment has aided in greatly reducing the dressing of welding tips and has increased the productivity of the cleaning operation.



Control every time parts enter or leave a given department.

Dominating the scene in the final assembly plants are the several assembly conveyorized lines on which the airplanes are completed. Of these, all but two perform the same function—one is a return or "clean-up" line, and the other a pre-flight line. The assembly lines all start with the fuselage assembly which is integrated on trunnion-type dollies, attached to the drag chain. Fuselage sub-assemblies are prepared in a department located at the side, transported to the assembly line by an overhead crane.

These assembly lines feed the "clean-up" line which moves in the opposite direction. Semi-completed planes are removed from fuselage assembly at the head end and transferred to the "clean-up" line for further operations. At the end of the "clean-up" line the planes again are transferred to the single pre-flight line on which the Airacobra is given its wings.

The aft fuselage, virtually complete when it reaches the assembly plant, is given its finishing touches in the sub-assembly department adjacent to the final assembly line, then transported by hoist to final assembly. The cabin is assembled in the same sub-assembly department and transported by crane to the assembly lines in much the same way as a body drop in an automobile plant.

Sub-assembly of the fuselage is handled in trunnion-type fixtures to facilitate the work of the operators. The various sub-assemblies are given their war paint in huge DeVilbiss spray booths of water-back type.

Electrically controlled hoists, operating on the various craneways, play a vital part in coordinating the assembly

*(Turn to page 87, please)*

**(Top of page)** One type of Plexiglas forming fixture used at Bell Aircraft. Plexiglas sheets are heated in Lindberg furnaces, then installed in the forming fixture and held until the material cools and hardens.

**(Center left)** Largest piece of equipment at Bell is this 5000-ton Lake Erie hydraulic press. It has two master control stations; four feeding tables which are rolled into place according to schedule. At maximum production, this press requires the services of 26 women operators.

**(Bottom left)** On the mezzanine—tube bending on one of the power-drive Parker bending machines.



# Airbriefs

By Henry Lowe Brownback

## History

I have been astonished from time to time to read releases made by the Army Air Forces dealing with the history of aeronautics in our military establishments. These releases seem to emanate from the historical section of the Air Corps at Wright Field and I remember reading a most remarkable statement about a year ago by the official AAF historian that "while a balloon corps had functioned during the Civil War, it had done little of practical value and was soon discontinued." Lately the Air Corps celebrated the thirty odd anniversary of its birth, so I think it is time that everyone interested in military aviation should know the facts, as it is a little pitiful to have a family crow about a Corporal in the Spanish War when it has a Revolutionary Admiral hidden in the closet.

The facts as I will give them can be easily verified by reading "The First Century of Flight in America," by Milbank, *Histoire de l'Aeronautique*, as published by *L'Illustration*, "Aeronautics in the Union and Confederate Armies," by F. S. Haydon, or a scrutiny of the records of the Smithsonian Institution, the Institute of the Aeronautical Sciences, the French Government Museum at Chalais Meudon, or the records of the Royal Aeronautical Society.

Actually the science of military aeronautics was born in the United States during the Civil War, although use of balloons had been made of in warfare before this in France. At the outbreak of the Civil War ballooning was having a world-wide vogue, and many daring and capable scientists were developing the new science with a view of fast travel, using air currents to carry their balloons, and many daring balloonists were demonstrating the new devices. In the United States two men, John Wise and T. S. C. Lowe were developing long distance ballooning, both with the idea of flying mail to Europe by using the air currents flowing from West to East in these latitudes. Mr. Lowe was greatly aided in his scientific research by Dr. Joseph Henry of the Smithsonian Institution, and during the actual outbreak of the Civil War was flying from Cincinnati to Union, S. C., in an exploratory flight to chart the altitude and speed of the great west-east air

current. When the war actually was well under way, nearly all of the balloonists offered their services to the Government, but none had a scientifically conceived plan save Professor Lowe and he, while the idea was opposed by the chiefs of the Army, was commissioned by President Lincoln to form an air corps and take command of it and to build the equipment, which consisted of seven balloons made of silk treated with a special secret varnish that made them more impervious to gas loss or air infiltration than any balloon had been made before or since; portable hydrogen generators of original design that made the balloon a practical adjunct to an army in the field; portable signalling and telegraph systems of original design; and instruments to use in making calculations by triangulation to give the range of enemy positions—as well as a floating base.

A number of capable aeronauts was trained for this specialized work including William Paullin, James and Ezra Allen, John Steiner, John Starkweather, and others. Ground crews were trained and the whole outfit welded into a most efficient unit, despite the constant attacks upon it by ground officers, who bitterly opposed new methods. Actually several thousands of flights were made, and both Union and Confederate generals gave it credit for turning the tide of some very important engagements.

After much controversy the Army took control of the Balloon Corps, placing it in the hands of officers hostile to it and its personnel, and it passed out of existence. Among the prominent foreigners who worked with it and got experience through it were the Count of Paris, Captain Beaumont of the British Army and Count Zeppelin.

In the first World War one of Professor Lowe's grandsons served in the Air Corps and in this war another commands a barrage balloon regiment. It is strange that the Air Corps has never named a single air field or station after any of these early pioneers who wrote history, and their sole recognition has come from the Maritime Commission, which recently launched a victory ship the "Thaddeus S. C. Lowe."

## Passing of Wood

After long discussion and many setbacks it seems that the wood cargo plane has definitely passed out of the

picture. The Curtiss ship has been cancelled, and the Waco contract reduced to fifteen units.

The wooden airplane in the United States never got off to a good start for several reasons. In the first place the aircraft industry was largely saved during the worst of the depression by the aluminum and petroleum industries as a possible outlet for the products, so that the entire technique of airplane building on any save the smallest units was built about the metal airplane. Thus at the outbreak of the war we had good metal ships and designers skilled in the manufacture of metal airplanes. When the metal shortage became acute the industry which knew metal and not wood tried to convert metal designs. Then someone made a set of specifications which rejected so much wood that it became almost impossible to manufacture planes of this material. Added to this were many types of new untried plastic glues or adhesives, the entry of many furniture makers into the field manned by men with no aviation experience, or green aviation men, and the use of molded plywood skins, which were a new development. The attempts of this new, inexperienced technique to compete with the established and known metal technique was often unsuccessful, and the wooden airplane has practically passed out of the picture, save for two large trainers and some gliders. Other countries more skilled in the wood technique have made remarkable planes, and it is to be regretted that our policy condemned the wooden ship without a fair chance to survive.

## They Carry Engines

In the last issue of *Airbriefs* we mentioned that other people beside the Germans were experimenting with engines on gliders. It has been disclosed that our own Waco glider has been fitted with engines, and given some very interesting results. The engines are very quickly attached to the standard glider and turn it into a very interesting power glider.

## Big Bombers

The rapidly expanding theater of war has made even our longest range bombers a little short on range if we are to get back of the enemy lines and really punish him. The new successor to the Flying Fortress, which is much larger, having far greater carrying capacity and longer range, will do much to open up the country far in back of the present bombing limits to the effects of heavy bombing, and this in turn may have a very profound effect on the course of the war. Here again the mere size of the airplane has greatly stepped up its efficiency over smaller types, and form one more stepping stone toward the really large airplane of the future.

# Possibilities of Furnace

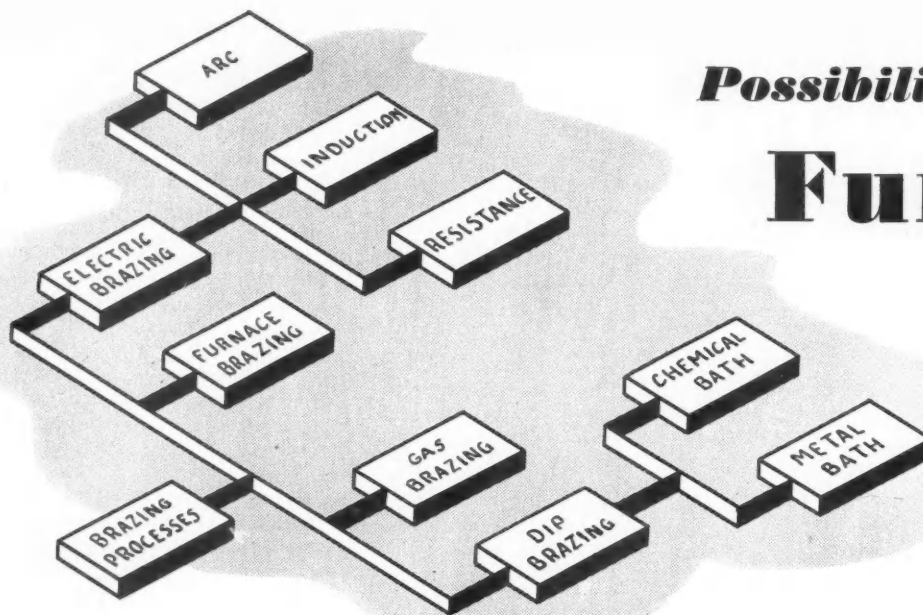


Fig. 1. Brazing process chart.

**B**RAZING is a method of joining metals by means of heat with a filler material consisting of non-ferrous metal or alloy having a melting temperature above 1000 F. Soldering is a similar process in which the filler material used melts below 1000 F. Welding differs from both of these processes in that it requires fusion of both of the parts to be joined. Fig. 1 is a brazing-process chart which has been adopted by the American Welding Society.

Brazing is a well-established process which has been adapted in recent years for use in mass production industries, and it already is being used extensively in the manufacture of automotive parts, refrigerators, computing machines, and various types

of electrical equipment. The recent development, by the Aluminum Co. of America, of a method of brazing certain aluminum alloys has induced the aircraft industry to investigate the feasibility of using brazing as a production process in airplane construction. In aircraft production brazing will be limited largely to ferrous and aluminum alloys, the two principal groups of metallic materials used.

## A. Ferrous Alloys

In the ferrous-alloy field, brazing must compete with well-established production processes such as flash-welding, projection welding and seam welding. Advantages offered by brazing when applied to ferrous alloys are as follows:

1. 100 per cent joint strength can be obtained in lap-type joints by merely increasing the amount of joint overlap.
2. Dissimilar metals and alloys can be joined satisfactorily.
3. Parts of different sizes and shapes can be joined satisfactorily.
4. By the use of a low-melting-temperature brazing alloy (1000 F), it may be possible to finish-machine and heat-treat parts to as high as 150,000 psi before joining, provided the brazing is done in a controlled-atmosphere furnace.

The disadvantages of brazing ferrous alloys are:

1. Production rates in general will be lower than with flash welding and projection welding.
2. In the case of telescoped joints, machining to close tolerances is required.
3. With most brazing alloys, post-brazing heat treatment is required if strengths higher

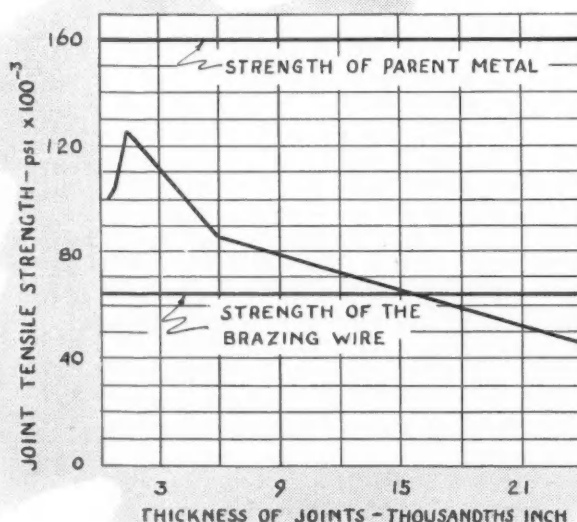


Fig. 2. Joint strength versus joint thickness.

# Brazing in Aircraft Production

By **H. D. Samuel, Jr.**

Production Research Engineer,  
Lockheed Aircraft Corp.

than the normalized strength of the parent metal are desired.

## B. Aluminum Alloys

In aircraft production aluminum alloys appear to offer a larger field of usefulness for brazing than ferrous alloys, since they are used more extensively, and production joining methods are not as well established as in the case of ferrous alloys. Most of the develop-

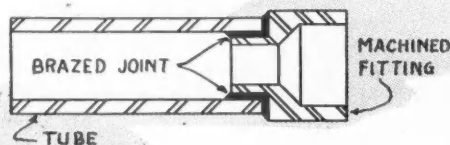
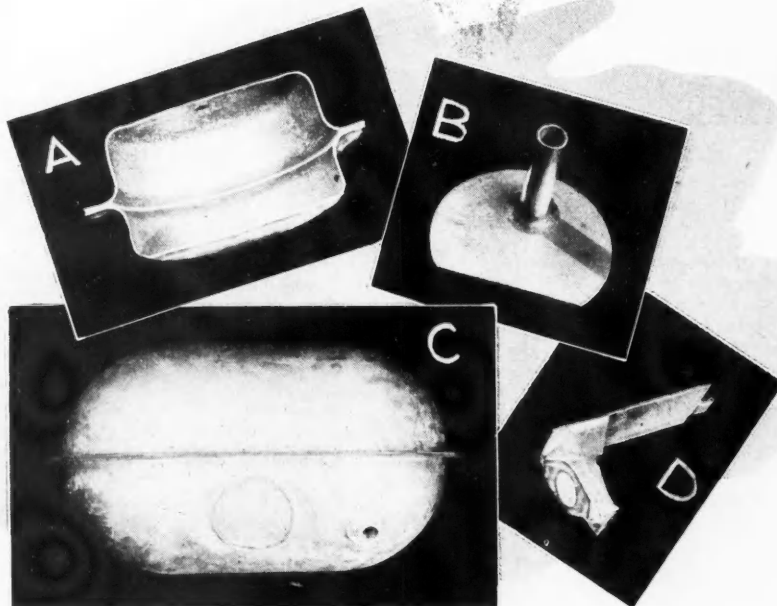


Fig. 3. Machined fit brazed joint.

ment of brazing materials for aluminum alloys has been carried on by the Aluminum Co. of America, and so far the process is limited to the work-hardening alloys (2S, 3S and 52S) and the precipitation-hardening alloys (51S, 53S and 61S). A satisfactory technique has not yet been developed for brazing the age-hardening alloys (14S, 17S and 24S). The principal difficulty appears to be inability to develop a brazing alloy that will bind these alloys at a temperature below 950 F, as higher temperatures cause incipient fusion and migration to the grain boundaries of the  $\text{CuAl}_2$  complex, thereby causing marked decrease in the corrosion resistance and mechanical properties of these alloys.

Fig. 4. These photographs show some examples of furnace-brazed parts that were made during the research investigation by Lockheed engineers. (A) Cross section of an aluminum tank with flange type joint. (B) Tube to sheet aluminum. (C) 10 gal. aluminum hydraulic tank. (D) Aluminum furnace-brazed joint of sheet to machined part.



When brazing is accomplished in an uncontrolled atmosphere, a flux must be used to remove the oxide coating on the surfaces to be brazed, to exclude oxygen from the joint area during the brazing period, and to aid the braze metal in wetting the joint completely.

## C. Strength of Joints

Brazing alloys now available in commercial quantities cover a wide range of flow temperatures and applications to ferrous and non-ferrous alloys. The strength of joints made with these brazing alloys varies over a considerable range, and appears to be a function of the joint thickness, the strength of the parent metal, and the brazing alloy. Some work has been done which indicates that there is an optimum joint thickness at which joint strengths can be obtained which are considerably greater than the strength of the brazing material. The reason for this increase in strength is not well understood, although it is believed that some alloying of the parent metal and brazing alloy occurs by diffusion. This investigation also disclosed that the joint strength falls off rapidly as its thickness varies in either direction from

(Turn to page 64, please)



These four photos show the construction and operation of the tube bender, developed by engineers of the Douglas Aircraft Co. A number of them have been installed at the company's plants. On a long job requiring few setup changes, as many as 3700 parts can be turned with it per eight-hour shift as compared to 250 parts by the previous method. Setup time averages 7 to 15 minutes, the operations and machine stop being listed numerically on a job analysis sheet furnished to the operator. Tube sizes from  $\frac{3}{8}$  in. OD to one in. OD by .049 in. wall thickness can be worked on the present equipment.

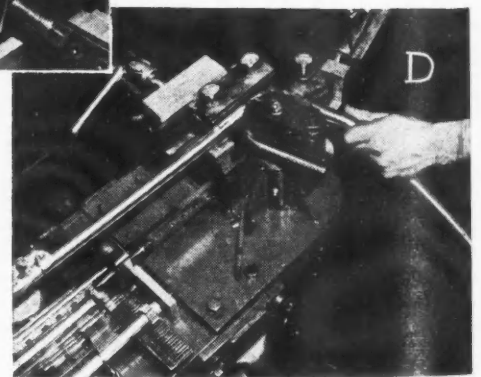
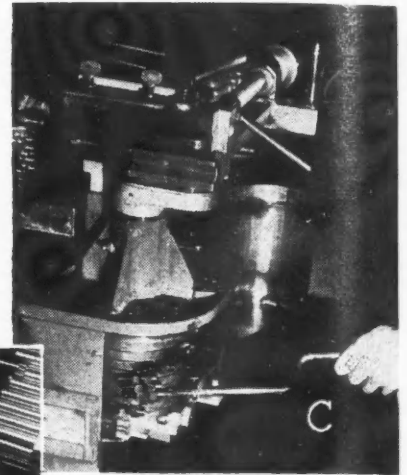
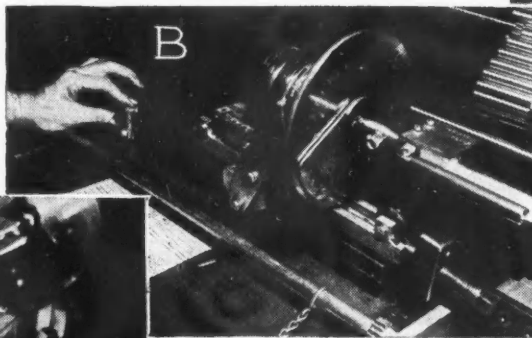
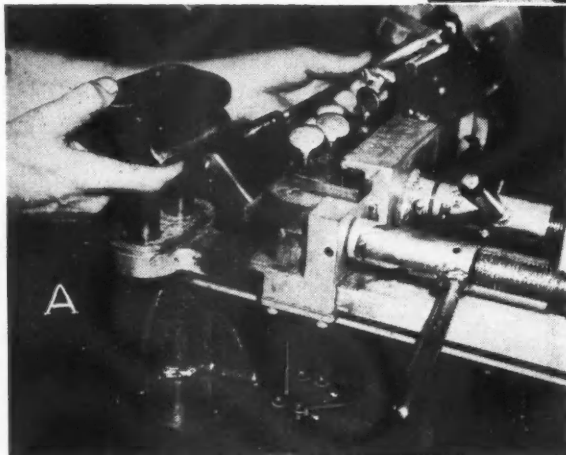
**A**—The operator first selects the correct radius block (at right hand) and mandril (at left hand) for the specified tube size. Lubricated hardwood slide block is shown clamped in the machine. As the tube slides between the radius block and slide block, the cylindrical mandril insert slides the tube to prevent its collapse or distortion.

**B**—Stops are set for the beginning of each bend along the tube. The angle of rotation for a bend is set next on the calibrated disk.

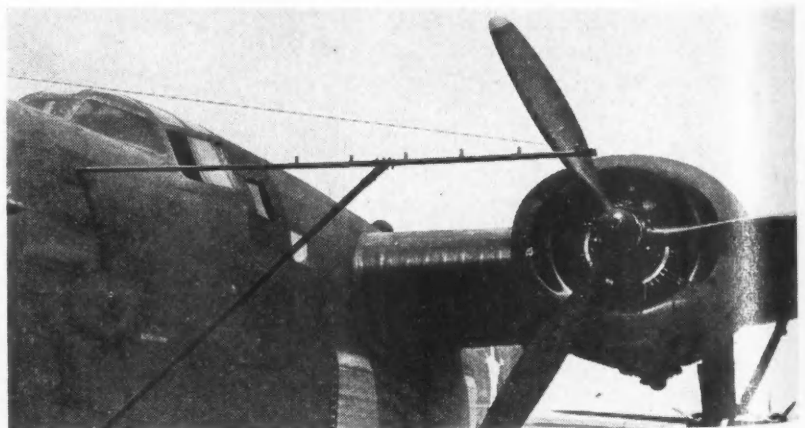
**C**—Cam stops are set for the degree of each bend, stops being available for nine bends if needed.

**D**—With the tube installed on the machine, the operator makes the bends. The clamp extension from the radius block is equipped with a hand grip and acts as a lever to facilitate bends. The progression of bends is foolproof. An incorrect bend will not result providing original setup was made correctly as all bends follow setup order.

# Short

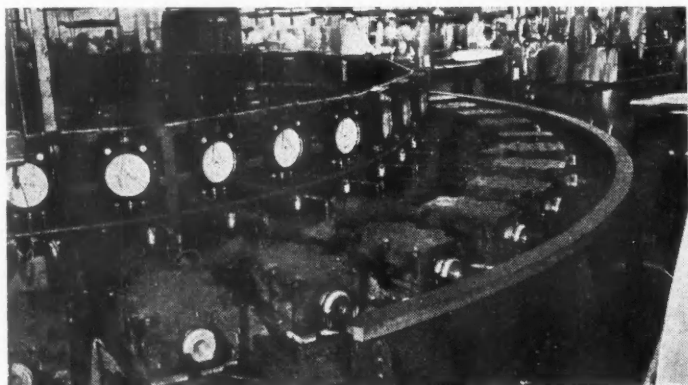
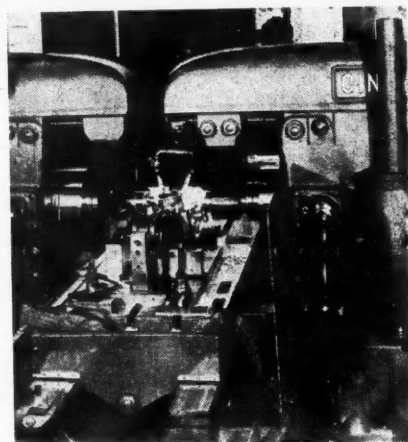


By means of the outrigger installed on this B-24D Liberator bomber, engineers of the Army Air Forces Materiel Command at Wright Field can produce ice formations on the propeller blades while the plane is in flight. Water stored in tanks located in the bomb bay of the ship is sprayed into the propeller through the outrigger. A camera inside the plane is aimed at the propeller through a specially built window and with the shutter speed synchronized with the propeller speed, detailed photos can be taken of ice formations and the rapidity with which the ice builds up and is thrown off the propeller, particularly at high altitudes where it would be difficult to observe them.

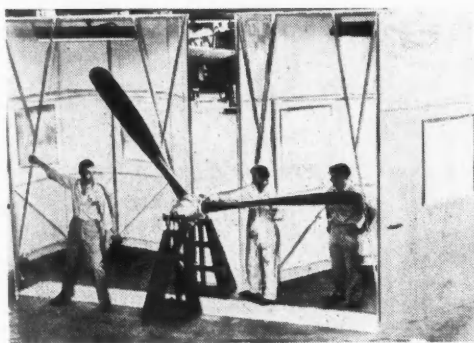


# Cuts

With this dual setup of Cincinnati milling machines, two jobs on an airplane landing gear shock strut requiring different operational speeds are done simultaneously at the Bendix Aviation Corp. It doubles the production rate.



Pre-installation balance testing of propellers under still-air conditions has been accomplished at the Brewster Aeronautical Corp. by installing this portable test room, which is large enough to accommodate two propellers and can be removed to various parts of the production floor. This portable test room is designed in two sections, mounted on rollers and pivoted on rear hinges. These sections are rolled around a six-foot deep pit and by its compact design, movement of air at the test stand is held to a minimum. The setup is 18 ft in width, 7½ ft. deep and 12 ft. in height. It is illuminated with fluorescent lighting.

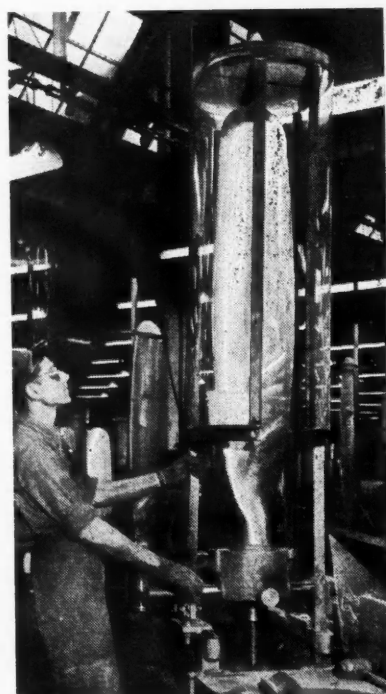


This 100-ton rotary machine of 40 ft in diameter, which was developed at the East Hartford plant of the Hamilton Standard Propellers Div. of United Aircraft Corp. to provide continuous, uniform molding of rubber fairings (cuffs) on propeller blades, has 42 half-ton molds, each of which has its individual system of air, steam, water and electricity, automatically controlled through cam-operated valves and Bristol pressure controllers. Each mold starts at a loading station, where a fairing has been built about the blade by hand from sponge rubber and covered with sheets of uncured ebonite. Next the table carries the mold under a 100-ton Farquhar hydraulic press, which forces out excess rubber and allows the mold bolts to be tightened. Then the mold moves successively through a steam heating cycle, a water cooling cycle, and finally to the unloading station half-way around the circle. The curing period for each blade fairing is about four hours, the blade being advanced to the next station every 12 minutes.



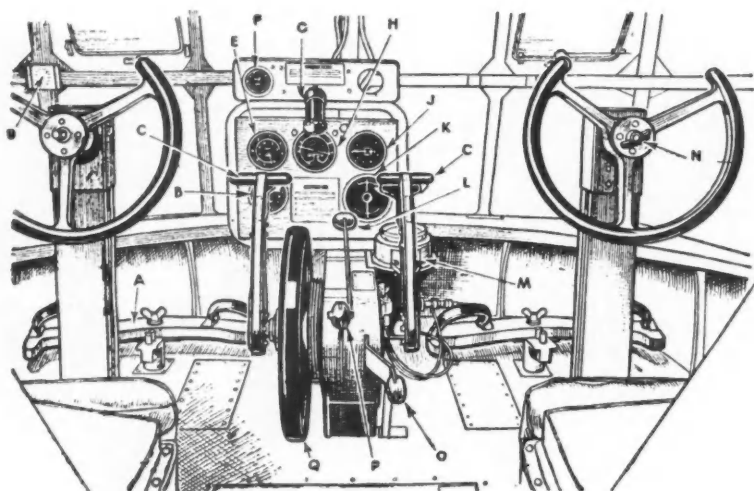
Use of the Robbins Sine Plate developed by the Robbins Engineering Co., Detroit, provides a method of quickly securing angular setups for jig boring. The Sine Plate, which ordinarily is used for inspection work, can be adjusted to the required angle, either single or compound, with standard gage blocks, and the work is attached to it. The plate is non-magnetic.

To protect propeller blades from air drafts during test balancing operations at blade-grinding benches and during final inspection, transparent plastic shields like the one shown here are being used at the GM Frigidaire plant. Formerly each blade had to be balanced tested in a special room, but with this new setup, time is saved and more accurately machined blades result.

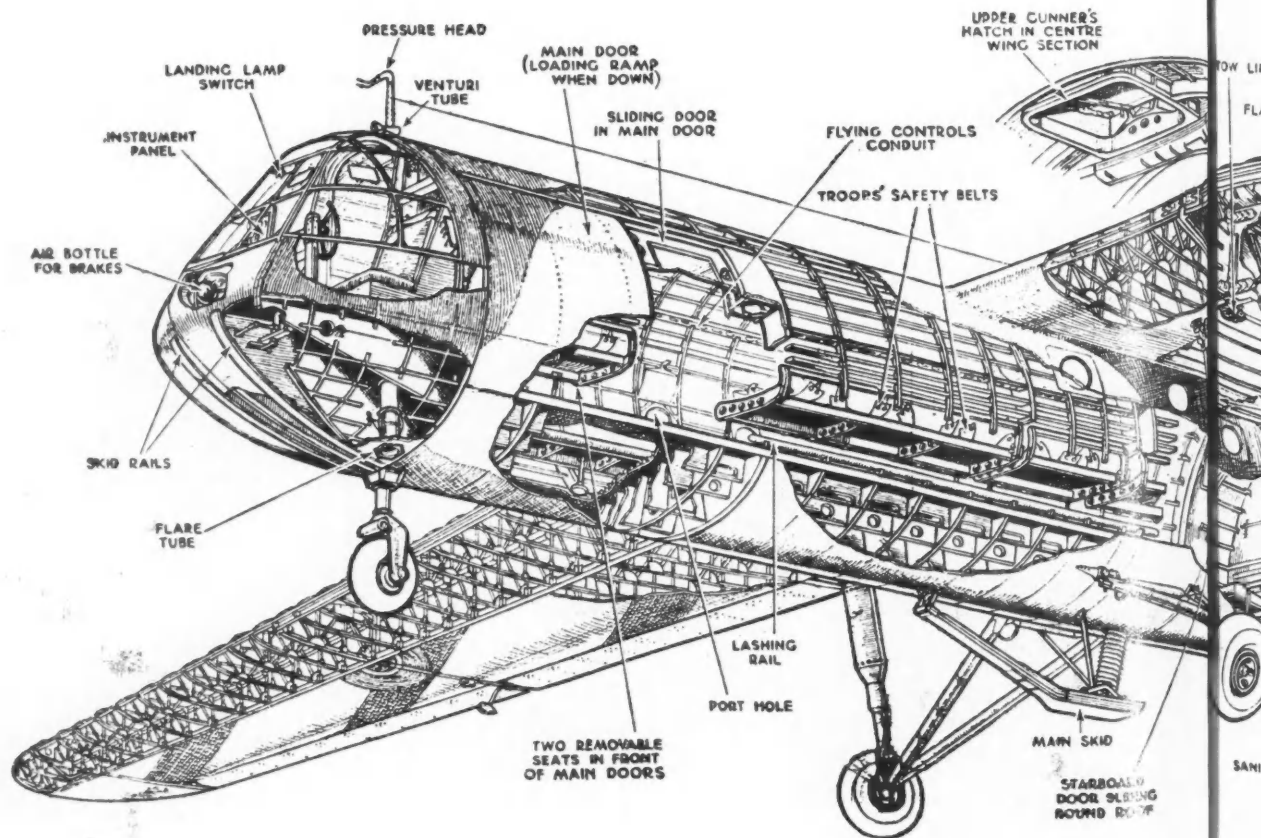


DESIGNED to Ministry of Aircraft Production specification No. 26/40, the Horsa carries two pilots and up to 25 troops. Most of the features of the construction and layout are shown in the drawings. In the sketch of the cockpit (below) the rudder bars are easily detached by undoing the wing nut A; B is the altimeter; C, air brake control levers; D, compass deviation card; E, airspeed indicator; F, air pressure gauge; G, instrument panel light; H, artificial horizon; J, rate-of-climb indicator; K, turn and bank indicator; L, tow-release control lever; M, compass; N, wing nut securing starboard control wheel; O, undercarriage jettison lever; P, flap-control lever; Q, elevator trimming wheel.

# Airspeed H



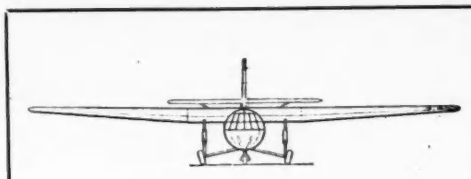
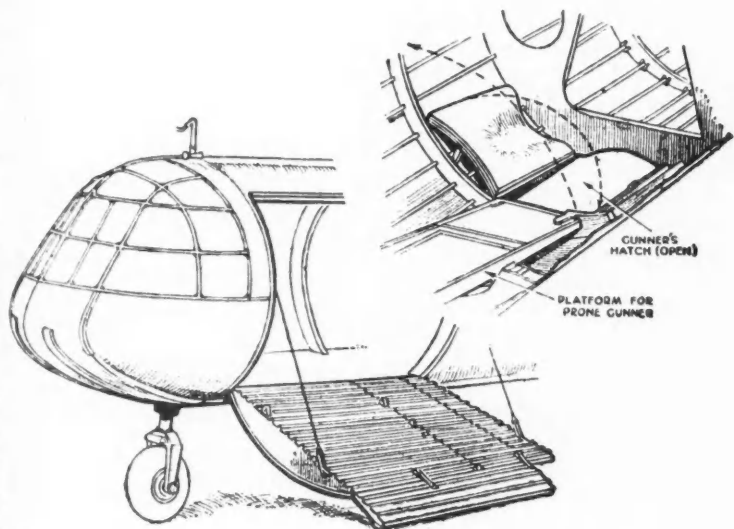
**T**HE Airspeed Horsa, which weighs 15,250 lb. with full load, is of wood construction, the fuselage being covered with plywood and the wing with fabric. If necessary during an emergency landing, the undercarriage can be jettisoned and a landing made on the central skid and the nose wheel, in which case the glider tilts until the wing tip touches the ground. Other design features are dual flying controls, ailerons of the slotted type, air brakes in the wings, and flaps.





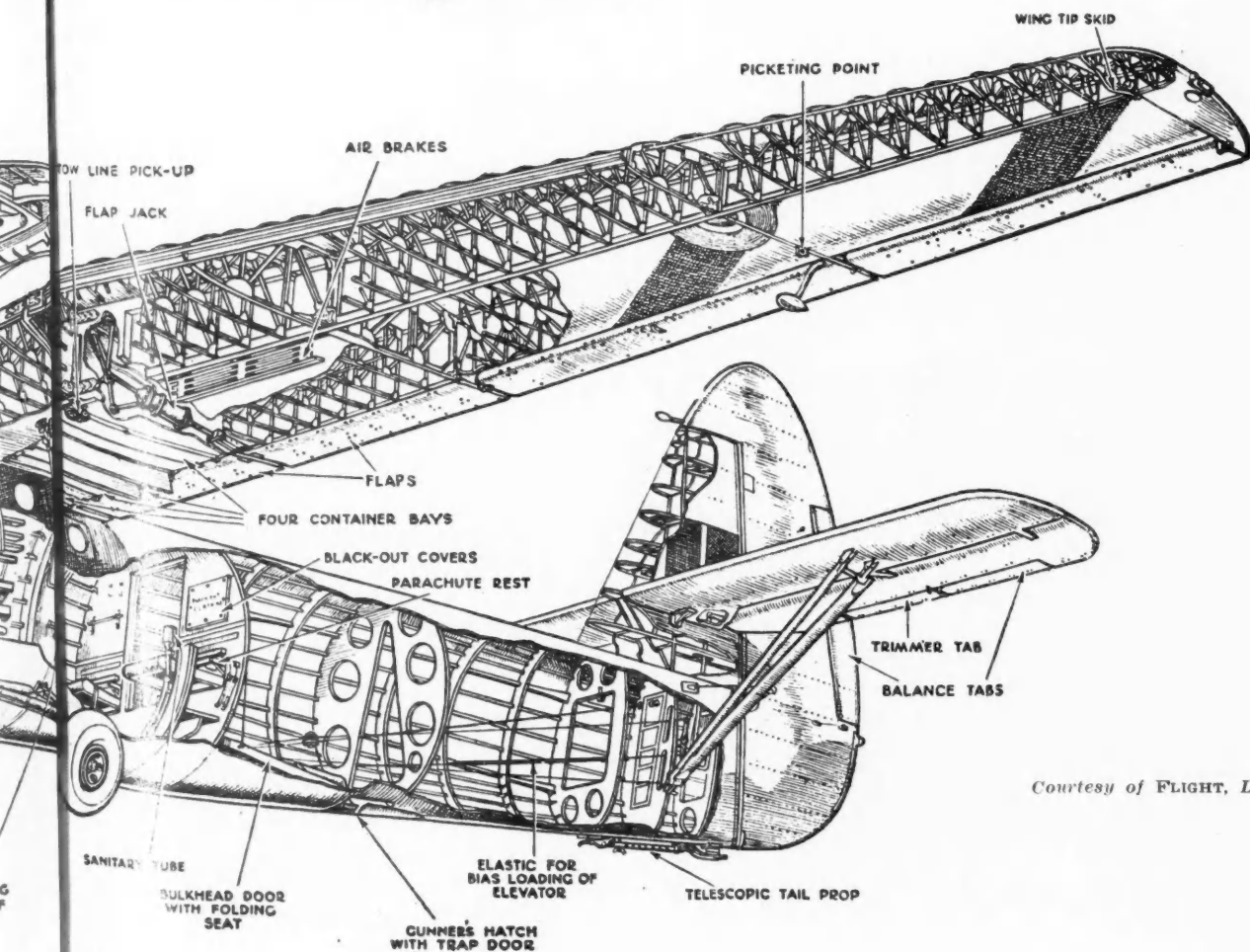
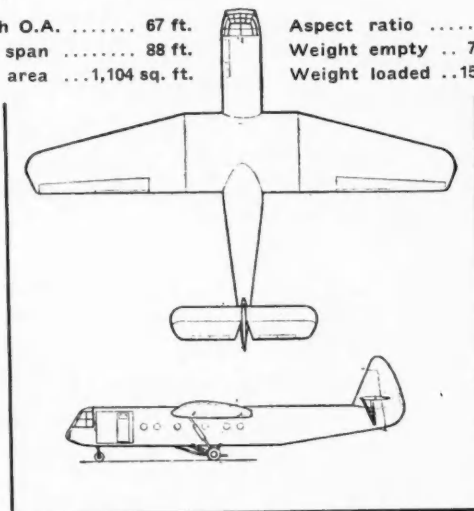
# Horsa

## Details of One of Great Britain's Transport Gliders



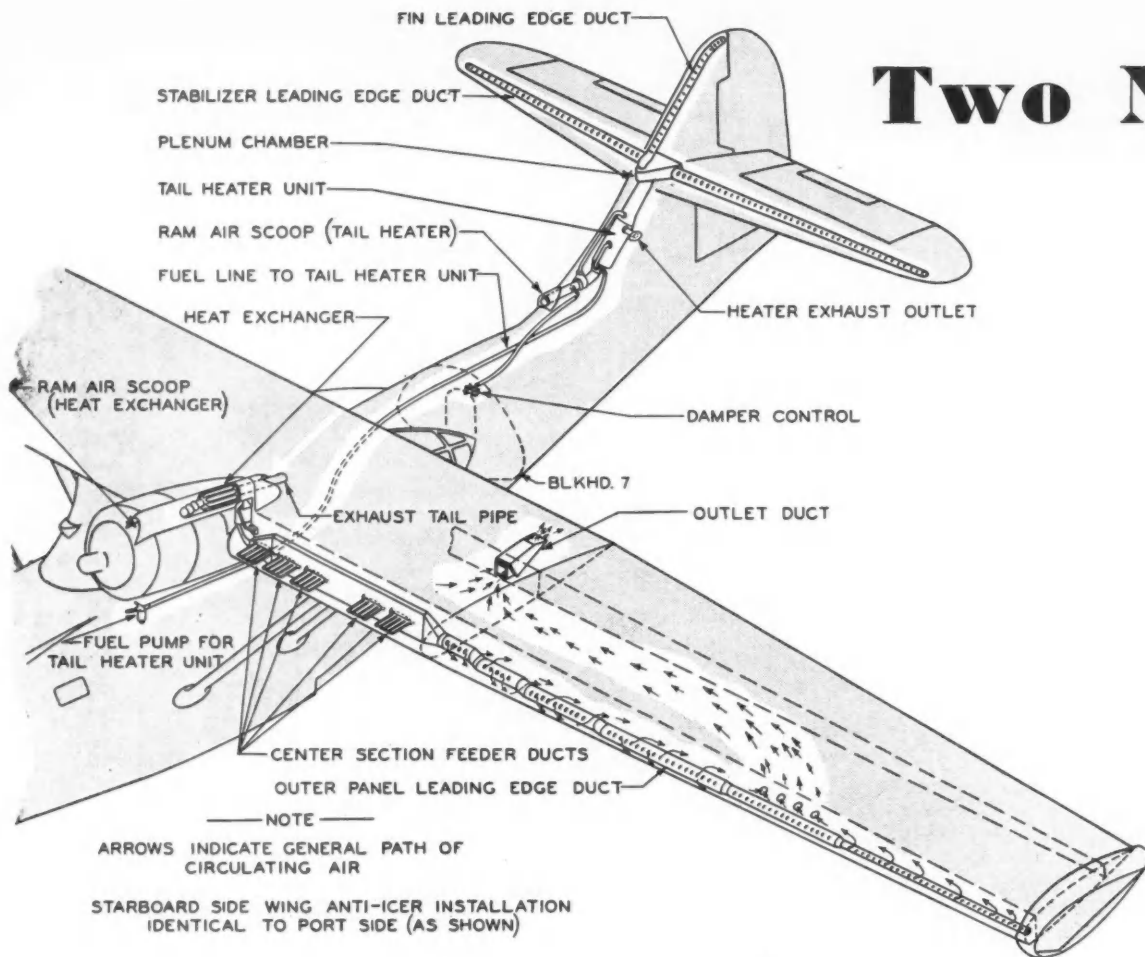
Length O.A. .... 67 ft.  
Wing span ..... 88 ft.  
Wing area ...1,104 sq. ft.

Aspect ratio ..... 7  
Weight empty .. 7,500 lb.  
Weight loaded ..15,250 lb.



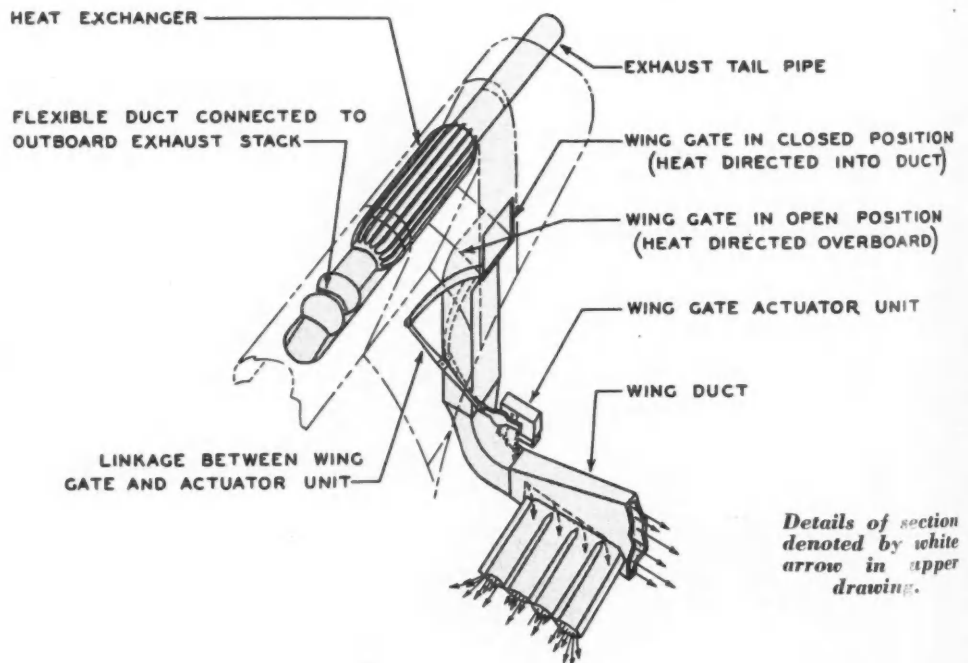
Courtesy of FLIGHT, London

# Two New



**A** THERMAL anti-icing system, which obtains heat from the exhaust gases of the plane's engines and transmits it to the wings, has been developed by the Consolidated Vultee Aircraft Corp. and the National Advisory Committee for Aeronautics. In the accompanying drawing the anti-icer is shown as installed on the port side of a Catalina patrol bomber, the same system being used on the starboard wing. Liberators and Coronados also will be equipped with it.

Air enters the ram air scoops on the engine nacelles. After passing through the heat exchanger, where outside air indirectly is heated by exhaust gases, the heated air travels chordwise through center section feeder ducts. It also flows spanwise, escaping from vents in the outer panel leading edge duct. It then is forced to circulate inside the wing, heating it. Heated air is then dis-



charged aft the rear spar.

In the Catalina, a heater is installed forward of the tail surfaces. Air is drawn into the tail heater unit from the outside, a special line passing through the fuselage to deliver fuel to this unit. The outside air, heated in this unit, is forced into a plenum chamber, where it passes up the fin leading edge duct and

# Consolidated Vultee Developments

along the stabilizer leading edge duct. Vents allow hot air to escape from duct, warming interior of entire assembly.

The diagram, Detail A, shows more detail in operation of heat exchanger, linkage between wing gate and actuator unit, a flow of heated air through wing duct and center section wing ducts. A study of the wing gate actuator unit shows that when gate is closed the heat is directed into wing, then when opened

in warm weather heat is directed overboard. The Coronado, like Catalina, has auxiliary tail heating unit, while the Liberator C-87 Express and P4Y (Convair Model 31), patrol flying boat described on page 26 in the Aug. 1 issue of *AUTOMOTIVE and AVIATION INDUSTRIES*, will draw heat for tail surfaces directly from engines. This new thermal anti-icing system adds no extra weight to aircraft, as it eliminates use of the rubber boot pulsating de-icer.

## Tire Changer for Big Bombers

**W**HEN the Tucson Division modification center of Consolidated Vultee Aircraft Corp. was established, one of the first difficult jobs that workers found slowing them was the changing the huge bomber's tires. On occasions it took as long as a day and a half to do the job. Later the tires were sent to a Tucson tire dealer to be changed, but this too took too much time and was expensive, so tire changers decided to rig up their own apparatus and the result was a device that proved exceptionally satisfactory in its operation, easy to construct in the plant and reasonable in cost.

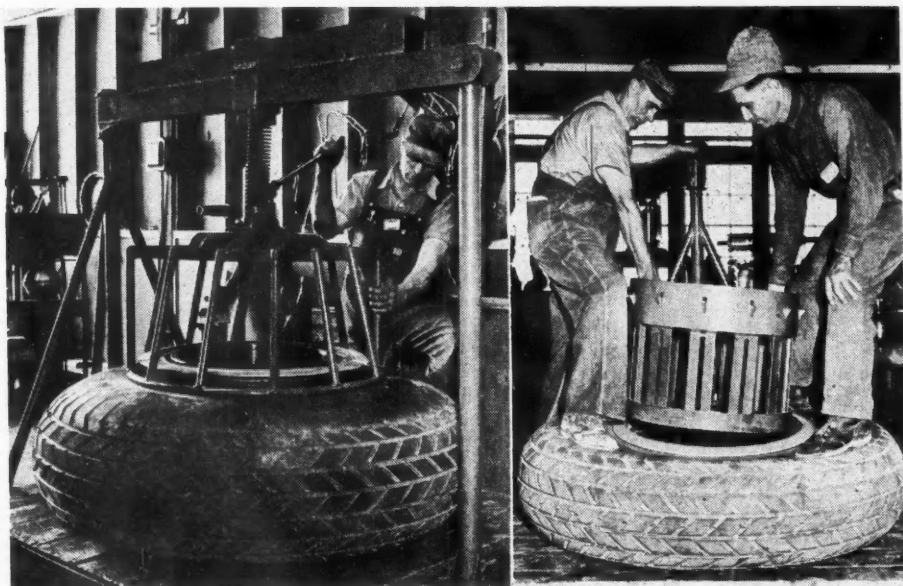
The device (left illustration below), which can be easily built in most machine shops, consists of a platform constructed of 8-in. channels, I-beam cross members, with 2-in. plank deck. Uprights of 2-in. pipe hinged on one side and carrying a head cross member of sufficient strength to withstand the pressure of a three-ton hydraulic jack, were erected and the jack placed in the center of the head frame. A spider was attached to the jack, and this assembly rigged to the top cross frame with a ball and socket arrangement. Two tension springs were attached for retracting the spider after the tire lock ring is removed. To operate the changer the spider is lowered about the lock ring of the tire, pressure applied by the hydraulic jack to depress the tire and the ring sprung free.

The next piece of equipment (right view) made in the plant was a squirrel cage affair for removing the loose side ring from opposite side of the tire. This was built of two rings with angle iron, pokes and loose dogs

set between angles with a hinge pin. Four thumb screws were placed in the top ring in order to center the top ring to prevent dogs overlapping and tearing the rubber. This piece of equipment was not, however, originated in the Tucson plant but was a copy of a similar one made in San Diego.

The upright structure and cross member can be swung clear from over the platform to facilitate placing the tire on the platform or removing it. One upright is on a caster assembly so that it will move freely and is also constructed so that it can be fastened securely to the platform with a pin arrangement.

Occasionally removing the loose side ring becomes difficult because of an exceptionally tight-fitting tire. When this occurs the spider is used to depress the tire, which is then inflated slowly. As air flows into the tire, pressure exerted by the spider is gradually decreased and the ring slowly forced free. By controlling the pressure exerted by the spider, it is possible to keep the ring from springing free suddenly.





*View of White half-trac chassis, without body installation, showing the detail of the bogie mechanism.*

**F**OR an outstanding example of the cooperation of the motor truck builders with Army Ordnance, we refer you to the Half-Trac program which has borne such fine fruit since the onset of the war. Under the guidance of the War Department, three important producers—White Motor Co., Autocar, and Diamond T—banded together on the development of a standardized line of vehicles, using a common chassis and interchangeable components.

The basic chassis as built by White, utilizes the White super-power truck engine, suitably modified as to accessories specified by the Army, chassis frame by A. O. Smith, clutch and transmission and universal joints supplied by Spicer, axles by Timken, track and rubber elements for the bogie assembly by Goodrich. White supplies the engine for installation by Autocar and Diamond T. More recently the scope of half-trac production has been augmented by the entry

# All Half-Trac Assembly

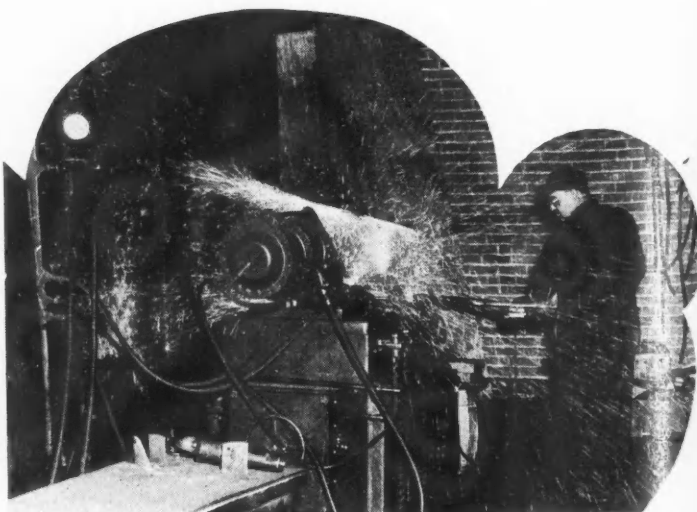
**By  
Joseph  
Geschelin**

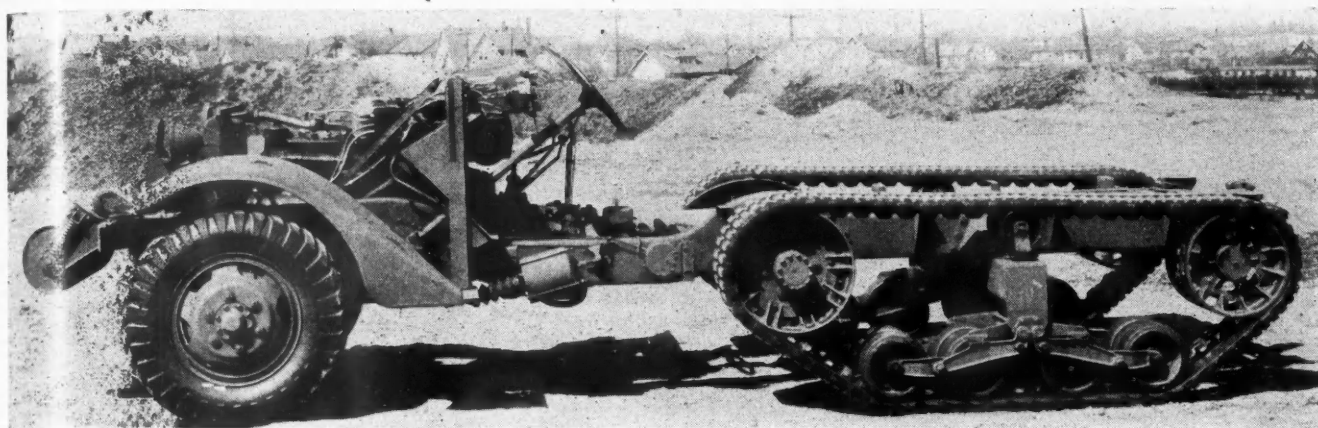
*Blakeslee's Niagara metal washing machines of various types are used in the White plant. This view shows the equipment in the department machining parts for the bogie assembly.*



*General view along the chassis assembly for half-trac and Scout cars.*

*The bogie unit "crab" assembly, consisting of two heavy forgings connected by two ribs, is butt-welded into a single piece in two operations on this Swift resistance welding machine.*





## Operations at White Plant on Mass Production Basis

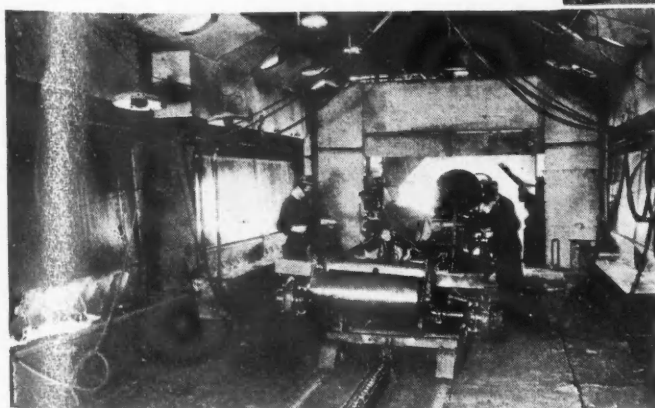
of International Harvester Co., building a similar vehicle but with different major components. At the present writing the Ordnance program includes the military vehicles denoted in table at the right and built on the half-trac chassis.

Significant feature of the team work of these producers through the TAC industry Integrating Committee for Half-Trac vehicles is the complete interchange of technical information. This covers changes in design of specification, information as to improvements in manufacturing methods, and extends even to the borrowing of parts, accessories, or complete components from among the members of the group in instances where this helps to maintain production in a given plant. Interchangeability has been carried to such a degree that each manufacturer uses the same parts lists, except for the cover identify-

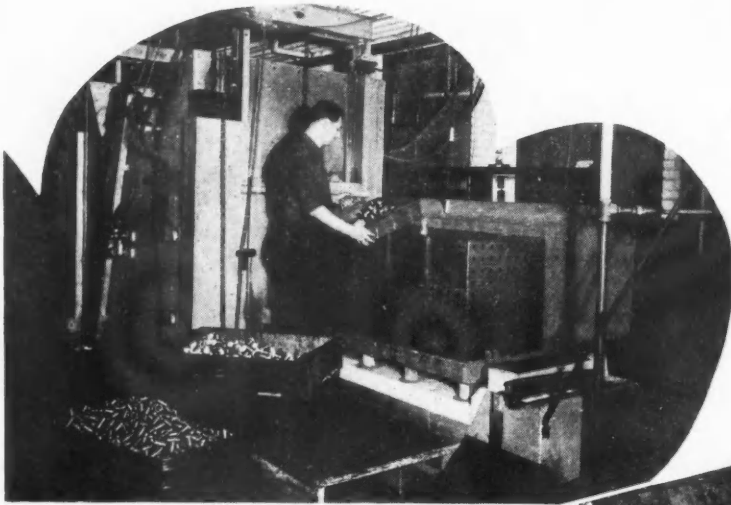
MODEL	DESCRIPTION	MANUFACTURER
Personnel	Carriers	
M2 & M2A1	Half-Trac Car	Autocar, White
M5 & M5A1	Half-Trac Car	International, Harvester
M3 & M3A1	Personnel Carrier	Autocar, Diamond T, White
M9A1	Personnel Carrier	International Harvester
Tank or Troop	Destroyers	
M4A1	81 mm. Mortar Carrier	White



(Above) Bogie assemblies are integrated on this line while rolled on the track. Initial operations begin at the extreme right with the wheel assemblies, continue past the stations in the foreground until the complete unit has been put together.



(Left) Inside the R. C. Mahon water-back chassis spray booth built over the half-trac final assembly line. The next station is the Fostoria infra-red drying oven.



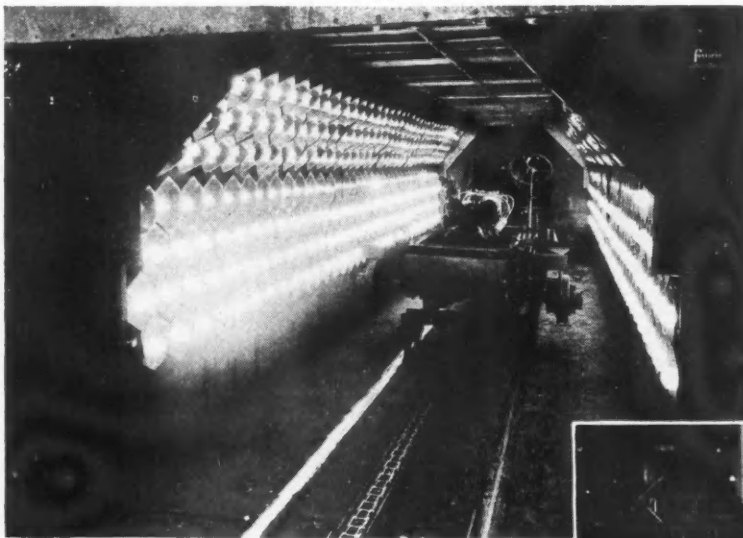
*(Left) Loading a charge of pins and bushings for the half-trac bogie assembly in preparation for nitriding in the newly installed Electric Furnace Co. unit shown here.*

*Instrument panel assemblies for military vehicles are built up on this merry-go-round gravity roller conveyor line.*



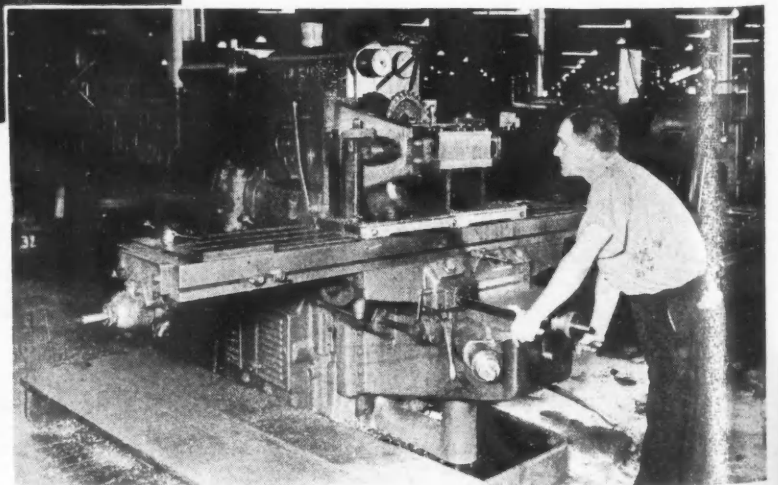
ing a particular make of vehicle.

In this article we are concerned, primarily, with some highlights of manufacturing activity at White. The brief text will be supplemented with photographs taken in various departments of the plant to provide a visualization of the production program. These include views of chassis assembly, engine assembly, dash assembly, bogie parts machining, and bogie as-



*(Above) Unique in motor car manufacturing is this long Fostoria infra-red chassis drying oven which is built in conjunction with a huge R. C. Mahon water-back spray booth.*

*(Right) Here is another stage of bogie bracket machining on a heavy-duty Milwaukee mill.*

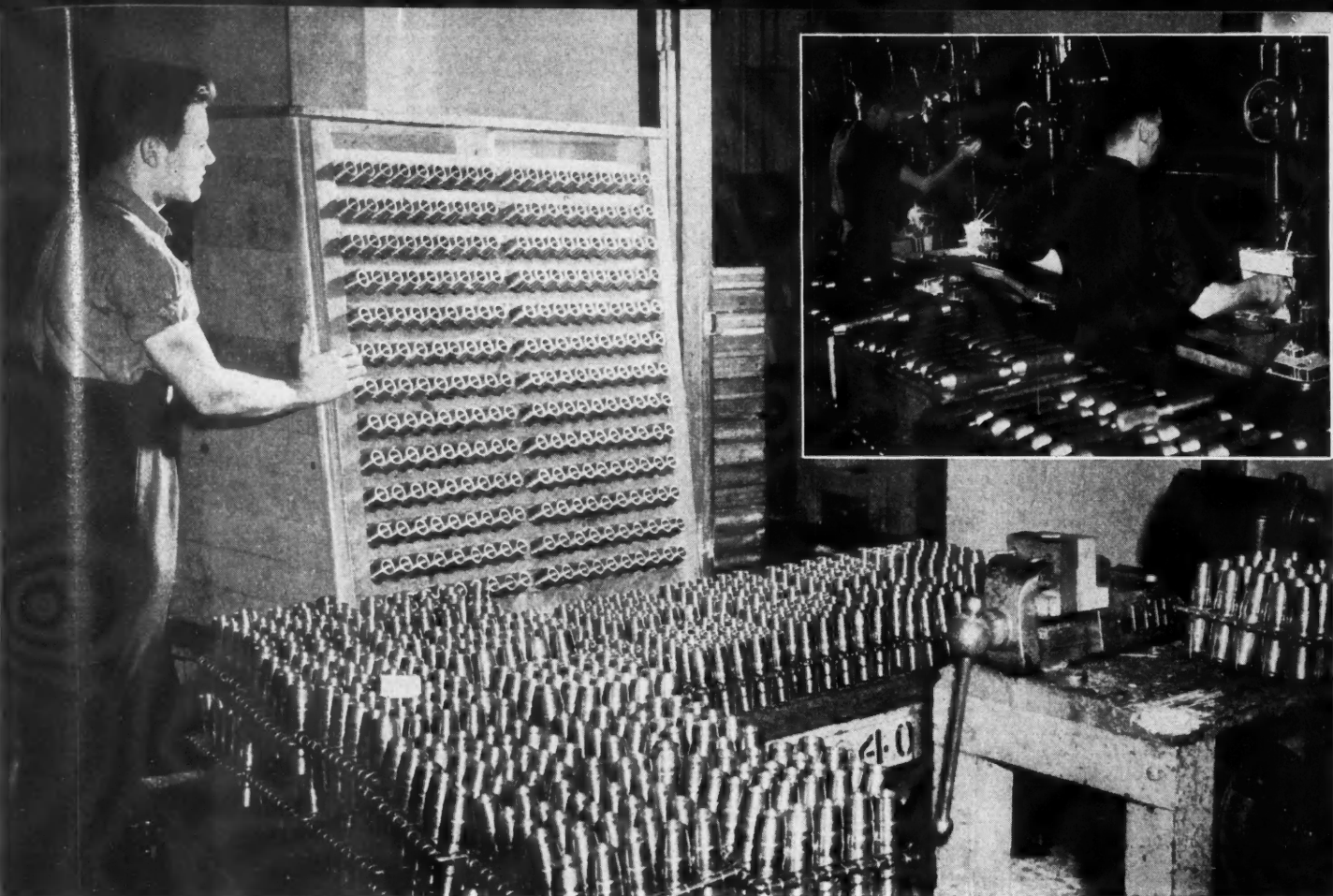


sembly. The manufacture of the well-known White Super-Power engine was described in *AUTOMOTIVE AND AVIATION INDUSTRIES* some time ago when the new high performance line was first placed on the market, and requires no further comment at this time.

It is well worth mention that all assembly operations at White—engine assembly, chassis assembly, etc., are completely mechanized and organized along mass production lines made familiar throughout the automotive industry. Since the inauguration of the half-trac pro-

*(Turn to page 90, please)*





*Canadian and British manufacturers use Inland Ledloy to speed war production.*

# **25% Less Scrap** **22% More Production** **50% Longer Tool Life**

**—with Inland Ledloy—the lead-bearing,  
faster machining, low unit-cost steel.**

This is only one of the many remarkable war records being made by Inland Ledloy. It is the case history of Ledloy used for the manufacture of 40 mm. shell in a Canadian munition plant.

Experiences like this led to rapid increase in demand for Ledloy before the war. Today, all the Ledloy that Inland makes is going into millions of shell and

many parts for war equipment—resulting in faster production, lower unit cost, and great savings in critical cutting tools.

When peace comes Inland Ledloy will again be available for general manufacturing use—helping to produce finer products at lower cost—products that can be priced to attract the most buyers.

SHEETS • STRIP • TIN PLATE • BARS • PLATES • FLOOR PLATE • STRUCTURALS  
 PILING • RAILS • TRACK ACCESSORIES • REINFORCING BARS

"Foreign Agent"—LEDLOY LIMITED, 66 Cannon Street, LONDON.



# **INLAND STEEL CO.**

38 S. Dearborn Street, Chicago

Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City, New York

# Kolene Metal Cleaning and "Tinning" Process for Bearings



*New metal-cleaning installation at Cooper-Bessemer's Mt. Vernon plant. Vats are positioned for production handling of each progressive step in Kolene process.*

**S**TEMMING from efforts to conserve critical materials in production for the war, particularly in the conservation of tin and basic bearing materials, the Kolene Corp., Detroit, Mich., developed a process of metal cleaning and "tinning" which makes it possible to produce an excellent and satisfactory bonding of high-lead babbitt to cast iron and to steel. It is also applicable to Meehanite castings and to bronzes.

The development has progressed to the stage where there are available a range of Kolene Kleaners of various types, suitable for cleaning cast iron, bronze, Meehanite, steel, and even special materials such as Alnico magnet alloys, so as to prepare surfaces for tinning, for soldering, or for brazing. Kolene Kleaner No. 1 is a catalyzed, molten, oxidation salt bath with a melting point of 500 F. It can be used in an ordinary iron or steel pot as there is no detrimental effect on the container. Kolene Kleaner No. 3 is a special material designed for cleaning cast iron in instances where acid pickling exposes new impurities on the surface. It provides a reducing salt bath which is said to be effective in removing oxides from the surface of cast iron without any attack of the base metal.

Studies of surfaces treated with Kolene indicate that in addition to providing a chemically clean surface for bonding or brazing, the treatment also produces an etching or mechanical key on the surface by removing carbon or graphite needles. When such surfaces are coated with the Flo-Met'l tinning medium, they exhibit a strong bonding action for babbitt linings. Flo-Met'l is a high lead alloy possessing extremely low surface tension so as to take full

advantage of the Kolene cleaning process. In cast iron, it flows readily into the microscopic needles resulting from the elimination of graphitic carbon; on steel surfaces, it permits of better contact with the decarburized base metal.

According to T. E. Eagan, chief metallurgist, The Cooper-Bessemer Corp., their experience with Kolene indicates that it provides an exceptionally firm and uniform bond between lead-base babbitt alloy and the Meehanite metal from which their bearing shells are cast. They also have found that this process provides such an excellent bonding as to make possible the elimination of the conventional practice of grooving or other machining of bearing backing, required in ordinary practice. This opens up new possibilities for cutting weight and saving Meehanite by reducing wall thickness, as well as additional cost savings by eliminating machining, according to Mr. Eagan. The installation for handling the Kolene

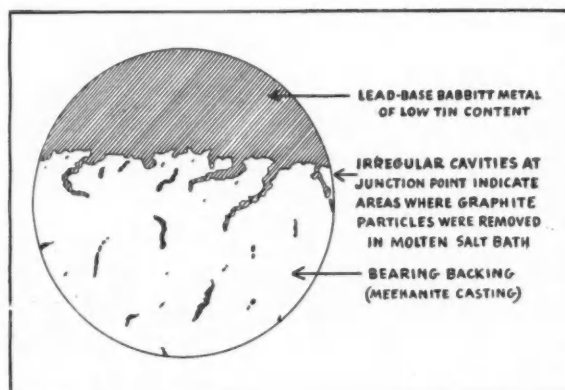
process at Cooper-Bessemer Mt. Vernon works, illustrated here, is said to be one of the largest of its kind in the country. Among other large installations is one made by Ingersoll-Rand.

Versatility of the Kolene process is exemplified by some of its other applications. For example, it is being employed for the cleaning of parts for brazing in applications where former methods have not been successful in achieving sound brazed joints. One such example, illustrated here, shows the brazing of steel tubular parts to a cast iron plate. With Kolene treatment, the brazed joint is stronger than the parent metal and produces leak-proof assemblies. Another use of the Kolene process is to provide a thin coating of Flo-Met'l on the overall surface of parts exposed to mild corrosion. Parts so treated resist atmosphere corrosion for weeks of shelf life.


The Kolene process and engineering service are offered freely to manufacturers without license agreements of any kind, since the company is interested solely in supplying the cleaners and "tinning" material. The simple equipment required for the process can be improvised by the user or can be designed to suit by any of the equipment manufacturers in the field. As an example of the simplicity of the Kolene process, we reproduce below a typical instruction bulletin on the treatment of cast iron bearings:

1. All surfaces to be coated for bonding must either be machined, or thoroughly sand-blasted to remove traces of silicon carbide in the surface, which is insoluble to all known chemical agents at operable temperatures.
2. Immerse bearing in Kolene Kleaner No. 1 at a temperature above 800 F (not above 900 F). This operation removes all sulphur, phosphorous, silicon, and graphite from the surface composition of the cast iron, as well as any grease or fingerprints that might be on the surface. It also converts relatively insoluble oxides into the higher and more soluble ferric oxide. Time of immersion varies with analysis of iron, but as a rule it is between 5 and 15 minutes after the temperature of the immersed bearing has reached the melting point of the salts.
3. Immerse in Kolene Kleaner No. 3. This is a water solution of salts which dissolves the ferric oxide produced by the No. 1 bath which, unlike acids, does not attack the base iron. Operating temperature—250 F, plus or minus 30 deg. Time of immersion varies with analysis, usually 15 to 30 minutes.
4. Both of these salt bath immersions are followed by a water rinse.

*(Turn to page 72, please)*



*Drawing made from actual micro-photograph at Cooper-Bessemer laboratory showing greatly enlarged section of (Meehanite) backing and lead-base bearing metal. Low tin content alloy flows into irregular cavities thus providing a secure anchor for bearing metal.*



## Notches affect impact strength

*Information supplied by an Industrial Publication*

The effect of fillet radius on the life of machine parts operating under alternating stress has been known for a long time. The knowledge has been put to good use in designing parts so as to avoid fatigue failures.

The effect of variation in the notch radius of Izod impact bars has shown the way towards the elimination of impact failures in filleted parts.

Two sets of standard size impact bars were

machined from one heat of steel, both with a 45° notch. In one set the notch radius was 0.01 inch and in the other 0.05 inch. After quenching, and in some cases tempering, the bars with 0.05 inch radius consistently showed about 140% improvement in impact strength.

The practical application of these results, which consisted of increasing the existing fillet radius, has eliminated impact failures in a part where the problem had become serious.

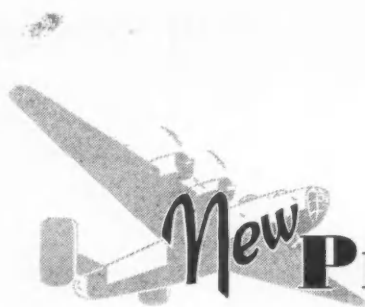
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

**Climax Mo-lyb-den-um Company**  
**500 Fifth Avenue • New York City**





# Products for Aircraft

## New Device Keeps Ice from Propellers

A device to prevent the formation of ice on propeller blades of aircraft has been developed by the United States Rubber Company's Detroit development division with the cooperation of the engineering staff at Wright Field. It is designed to remove the threat of the loss of the airscrew properties and the balance of propellers caused by ice col-



*A new device for preventing formation of ice on propeller blades of aircraft which has been announced by United States Rubber Company*

lecting on the blades when sleet or icing conditions are met in flight.

A development of the United States Rubber Company known as Uskon conducting rubber makes this device possible. This material, through the addition of certain chemicals, is made to conduct electricity, in contrast to the usual insulating properties of ordinary rubber.

A strip of conductive rubber is attached to the leading edge of each propeller blade. The passage of electricity

through the material heats the leading edge sufficiently to keep ice from forming—an obvious advantage over methods of dieing which function after the ice has already formed.

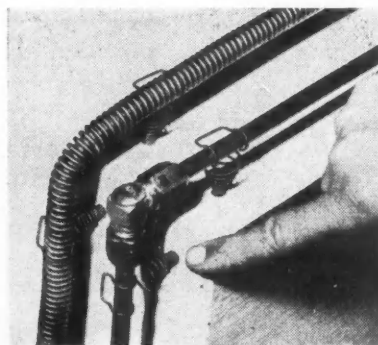
Test flights using the new device have been conducted by the staff at Wright Field and have determined its merit. The National Advisory Committee for Aeronautics is also engaged in a study of anti-icing problems and will also carry on further experimentation with the conductive rubber unit.

It is expected that the principle used in the new device will be applied to other anti-icing problems in military and civilian aircraft.

## Packless Flexible Fastener for Tubing

There has been added to the list of vibration absorbers a device, known as the Packless Flexible Fastener, which has the combined functions of a supporting strap and a vibration absorber for stationary or movable tubing. It was originated by the Packless Metal Products Corporation, New Rochelle, N. Y.

The fastener consists of a sensitive spring, cone-spiraled and terminating in a clip which snaps on to the tube or similar unit to be fastened; the right size fastener being chosen to fit the outside diameter of the unit. The fastener is affixed to a supporting surface by means of a screw fitted through the cone. Inasmuch as it flexes in all directions, the fastener can be installed in either lateral or vertical position. Its small hose area both facilitates placement and gives a large working area to the cone.

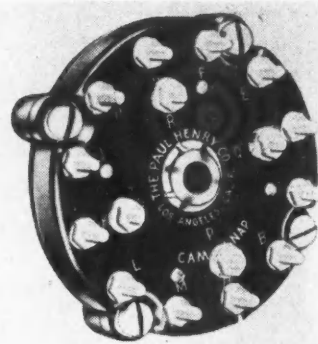


*The Packless Flexible Fastener*

## Selector Switch for Aircraft

A new type aircraft selector switch incorporating snap action has been recently brought out by The Paul Henry Company, Los Angeles, Cal. Under Bureau of Aeronautics testing, this switch is said to have far surpassed its normal life requirements.

Known as a Cam-Snap Rotary Tap Switch, it is made with from one to four primary circuits and twelve secondary circuits. Wide latitude of application is possible, such as pilot compartment heater control, wing flap control, cowl flap control, and others where the sequence of operation is important to assure the operation of various other functional mechanisms. Opening and closing of a circuit is accomplished within three or four degrees motion of the cam. A conservative current rating



*Cam-Snap Rotary Tap Switch*

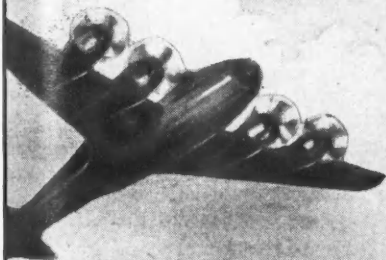
for 50,000 operations is 10 amperes at 29 volts, inductive load. Used as a selector switch, it can be mounted singly or in gang and operated by a single shaft.

## Machine for Tube Bending

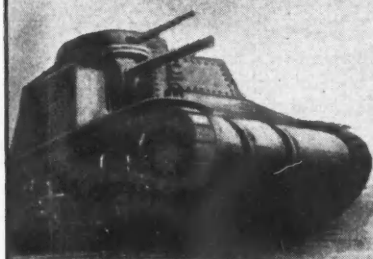
O'NEIL - IRWIN MANUFACTURING CO., Minneapolis, Minn., is placing on the market the Di-Acro Bender No. 3, a machine designed especially for aircraft, marine and other large radius bending. It will form or duplicate all types of tubing, channel, angle, I-shaped sections, and round, square, flat or other shaped solid or open cross section materials. Interference can be quickly

(Turn to page 108 please)

# For pressure-tight... leak-proof unions!



Pressure-tight and leak-proof assemblies are of vital importance to the efficiency and proper maintenance of trucks, buses, planes, tanks, tractors, boats, diesel engines, pumps, pipelines and industrial machinery.



Permatex Form-A-Gasket No. 1 . . .  
Form-A-Gasket No. 2 . . . Aviation  
Form-A-Gasket and Pipe Joint Cement  
are as important as tools a mechanic  
uses to do the right job on gasket  
assemblies, flange unions, threaded  
connections, pipe joints and many  
other assemblies.



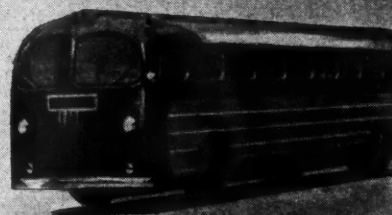
These Permatex sealing compounds are  
leak-proof to gasoline, kerosene, fuel oil,  
hot or cold lubricants, hot or cold water,  
salt water, illuminating gas, ethylene  
glycol, glycerine and numerous other  
liquids and gases.



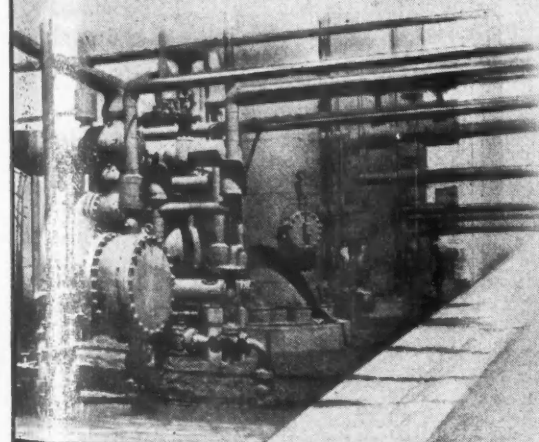
Permatex Form-A-Gasket No. 1 is a soft paste that  
dries fast and sets hard.

Permatex Form-A-Gasket No. 2 is a soft paste that  
dries slowly and remains pliable.

Permatex Aviation Form-A-Gasket is a heavy  
liquid that does not dry and does not run. Readily  
brushable and self-levelling.



Permatex Pipe Joint Cement is a heavy liquid that  
does not dry or crack. Applied with a brush.  
Permits easy readjustment. Disassembles readily.



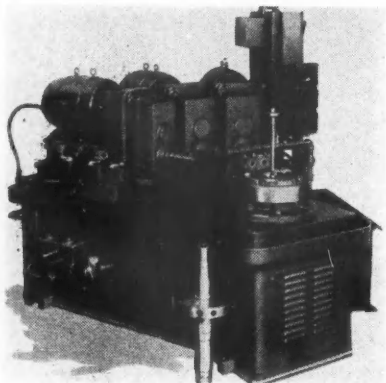
PERMATEX COMPANY, INC.  
Sheepshead Bay, N.Y., U.S.A.



# New Production Equipment

**F**IFTEEN holes, equally spaced around an extended pan on a forged aircraft propeller shaft, are drilled by an automatic cycle machine designed and built by Snyder Tool and Engineering Company, Detroit, Mich.

The machine is a horizontal, three-way, hydraulically-operated drilling machine with three drill heads, each with an individual hydraulic feed cylinder. The three heads are geared to-



*Snyder Automatic Cycle Machine.*

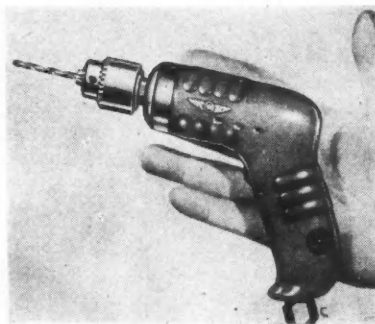
gether for single electrical control. Operation is automatic and continuous until all 15 holes have been drilled. The index mechanism is electrically synchronized and, after five indexes, the machine stops for unloading and re-loading.

Hydraulic equipment is housed in the welded steel base and coolant is contained in a separate tank and trough at the side of the machine.

The saving in time over conventional single hole hand drilling on a standard machine is said to give this special machine three times the ordinary rate of production.

**A** PNEUMATIC drill with all-plastic housing and handle to save weight and reduce fatigue of workers is announced by The Aro Equipment Corporation, Bryan, Ohio. Said to be today's lightest-weight portable pneumatic drill, weighing 1 lb 12 oz, this tool delivers unusual power for its small size so that a wide range of small tool production jobs can be handled.

This pneumatic drill operates at 2500 rpm, is 6¼ in. in overall length, and accommodates ⅛ in., 3/16 in., ¼ in. or

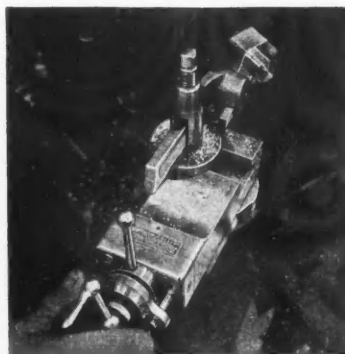


*Aro Pneumatic Drill*

5/16 in. drills with Jacobs chuck. It has full ball bearing construction, a motor of finest alloy steels, and a built-in visible oiler which enables the operator to see that the drill has an adequate oil supply at all times. A non-slip grip is assured by the ribbing which is incorporated in the design of the plastic handle.

**T**HE Vard Lathe Compound brought out by Vard, Inc., Pasadena, Cal., is a supplementary attachment which replaces the cross slide of the lathe. It holds a single or multiple tool post and is equipped with a graduated dial accurate to 0.001-in.

The compound was built to reduce the number of hand operations involved in cutting threads or other machining tasks where continuous tool resetting is required. With this compound it is possible to cut threads right up to a working shoulder at normal lathe speeds. The traverse, or quick-release lever in the compound, works on a triple lead Acme screw and backs off the cutting tool a full 3/16-in. from the



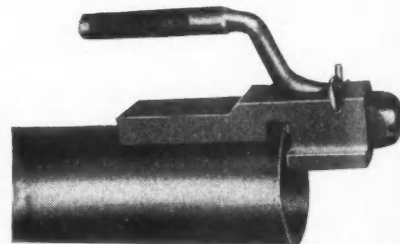
*Vard Lathe Compound*

work with one quick movement. By simultaneously reversing the lathe and releasing the compound, the next cut can be set on the compound dial with one hand as the lathe reverses the tool to the starting point of the cut.

**L**ATEST addition to the line of marking devices manufactured by the M. E. Cunningham Co., Pittsburgh, Pa., is the Box Type Shell Marking Holder.

This specialized war production aid has been designed for marking on ends of hot, rough, turned shells. An outside box with safety handle includes a grooved guide which holds a type holder in the correct position to give a complete, clear impression.

A solid, one-piece safety steel type holder is said to give maximum service and to resist spalling and mushrooming, and is held in place by a special shep-



*Cunningham shell marking holder*

herd hook pin which is easily removed for changing type inserts. These shell markers can be made for any size or number of characters.

**T**HE Sheffield Corporation, Dayton, Ohio, has developed a machine for precision checking of balls for ball bearings much faster than was possible with methods formerly used. The new machine checks and sorts balls of dimensions ranging from ⅛ in. to 11/16 in. With one machine, balls are checked at the rate of 15,000 to 20,000 an hour. Improvements have also been made in reducing the tolerance limits. However, the greatest advantage of the new machine is said to be its ability to check and sort balls into ten classifications at one operation and to extremely close tolerances.

With the Sheffield machine balls are placed in the hopper and a walking beam or arm lifts them over a few



# Let Carpenter help you produce MORE STAINLESS PARTS—*faster*

Helping you speed output of perfect Stainless Steel parts, and cut rejects to a bare minimum, is part of Carpenter's wartime job. The groundwork for this job was laid many years ago when Carpenter invented Free-Machining bars and developed ductile Stainless Strip. Today, Carpenter Stainless Steel is licking more and more tough fabricating problems. And daily we are adding to the wealth of practical experience we have gained in working with Stainless users.

Take advantage of Carpenter's diversified knowledge of Stainless Steels. Your nearby Carpenter representative can help you *in the shop*—and can provide you with assistance from our Metallurgical Department.



**Faster machining**  
of this gear is made possible with Free-Machining Carpenter Stainless. At the same time, Carpenter Stainless Steel keeps wear and corrosion of such parts to a minimum, prolonging service life.



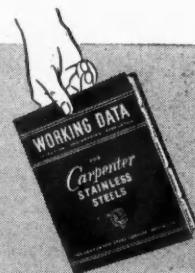
**Easier fabricating**  
Carpenter Stainless Strip helps speed output of this aircraft carburetor part. Then too, the ductility of this Stainless Strip makes possible smooth forming and deep drawing.



**Fewer rejects**  
in making these all-Stainless steam trap parts result from the constant uniformity check of Carpenter Stainless Strip at each step of manufacture. And this Stainless protects products from the most severe temperature conditions.



**Close tolerances**  
on the two metal screens of this pigeon liver slicer are met easily when Carpenter Stainless is used. And in service, this Stainless combats corrosion from blood and constant sterilizing.



## Here's fabricating data

for your production men. They can use this information to help iron out fabricating difficulties all along the line. These are some of the subjects covered in the Fabricating Section of our 98-page book, "Working Data for Carpenter Stainless Steels":

- Machining
- Forming
- Stamping
- Bending
- Forging
- Annealing
- Welding
- Grinding

## And here's helpful design-engineering data

about Carpenter Stainless Steels. "Working Data for Carpenter Stainless Steels" covers these and other subjects:

- Physical Properties
- Corrosion Resistance
- Electrical and Magnetic Properties
- Workability
- Heat Resistance

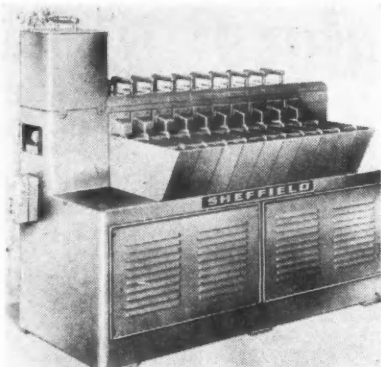
A copy of "Working Data for Carpenter Stainless Steels" is waiting for you. Drop us a line on your company letterhead and we will get it off as soon as possible. This Working Data book is offered to users of Stainless Steel in the U. S. A.



**The Carpenter Steel Company**  
103 Bern St., Reading, Pa.

# Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia



Sheffield ball checking machine

inches to an opening with parallel sides. If the balls are of the same size as the opening, or smaller, they fall through and are retained in a compartment below. This first step eliminates all undersize balls. The remaining balls remain on top of the opening and the walking beam carries them on to the next stage where the aperture is slightly larger.

The process is repeated until the balls drop into one of the divisions or are too large to pass inspection and fall into the last compartment. The machine can be set to segregate balls in ten classifications, first those that are undersize, then eight successive steps,

each say .00005 in. larger than the preceding size and the tenth station is for oversize balls.

Master blocks having carboloy inserts are used for the progressive steps of .00005 in. The dimensions of the inspection steps can be regulated by changing the size of the opening between the parallel sides. The operator only needs to keep the hopper filled and the machine automatically sorts the balls into groups of the same size.



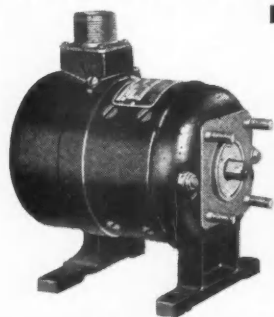
★ When you are confronted with a motor problem, whether for new or redesigned equipment, we suggest that you keep the following points in mind:

*First.* the experience of a motor manufacturer who specializes in fractional horsepower, special application motors can be extremely valuable to your engineering department.

*Second.* because it usually requires considerable time to thoroughly analyze the various problems of motor design and application, it is advisable to discuss the motor in the early stages of product development.

*Third.* satisfactory performance depends vitally upon *thorough engineering*—featured in all Black & Decker motors.

**THE BLACK & DECKER ELECTRIC CO.**  
KENT, OHIO



THOROUGH ENGINEERING is the basic factor behind the successful operation of this hydraulic pump motor and many other fractional horsepower motors we have designed for all types of equipment

**Black & Decker**

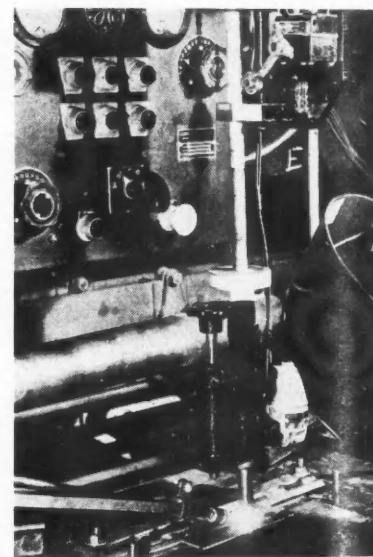
FRACTIONAL HORSEPOWER  
SPECIAL APPLICATION

**MOTORS**

**T**HE development of both manual and automatic arc-welding equipment specifically designed for the welding of magnesium, magnesium alloys, aluminum and other high-strength light alloys under a protective shield of helium gas, has been announced by the General Electric Company, Schenectady, N. Y.

A hint of things to come in the arc welding of magnesium and other hard-to-weld metals is given by an automatic unit now in use at the G-E welding laboratory. Completely automatic after preliminary adjustment, this equipment makes a smooth, clean weld under a shield of helium gas at rates up to 40 in. per minute on 1/8-in. stock, for example.

Substantially the same as a G-E unit now installed at the plant of a large producer of magnesium, this machine incorporates a new electronic motor



G-E Automatic Welding Unit

control which enables the equipment to hold the proper arc-length even while the arc climbs and descends inclines, such as encountered in welding curved-surface parts.

The filler metal is unreeled into the work at the correct angle through the small nozzle rod at the lower left. The tungsten electrode used to start and maintain the arc extends through the center of the rod that is perpendicular to the work and the helium gas is fed around the electrode.

(Turn to page 92 please)

# How TO SELECT THE RIGHT CUTTING FLUID

- 1. For Machining Nickel Steel**, and ductile steels generally, if the cutting operation produces a curling chip that bears heavily on the face of the cutting tool, use a cutting fluid high in anti-weld and anti-friction properties. Such properties are generally found in sulpho-chlorinated oils containing some saponifiable material. If visibility and ease of inspection are also of importance the oil should be of the transparent type. Chillo oils No. 140 or No. 143 will be found particularly adapted for service of this kind.
- 2. For Similar Operations** but where transparency is not a factor and where the work warrants the use of a lower priced product of the sulpho-chlorinated type, without saponifiable material, we recommend Cities Service Grade A Cutting Oil. This oil has many satisfied users.
- 3. For Less Severe Operations** these base oils can be had in milder concentrations to meet varying requirements—of tool life, finish, cost, etc.
- 4. If Maximum Protection Against Staining** is a factor, or if a high degree of transparency is desired, in moderately severe operations, a mineral-lard oil in varying proportions, like Chillo Oils 1 to 5, will be found particularly applicable for the purpose.
- 5. Where Cooling Is Of Paramount Importance**—as in grinding operations—to assure accuracy and prevent distortion—oil-water emulsions frequently are desired. This type of cutting fluid is also often selected for operations where cost is a deciding factor. We suggest Cities Service Soluble Oil for these requirements.

*Call your nearest Cities Service Office today—ask to have a Lubrication Engineer prove the value of these products on your own equipment. There is no cost or obligation.*

**FOR COMPLETE CUTTING OIL MANUAL, WRITE TO CITIES SERVICE OIL COMPANY, SIXTY WALL TOWER, ROOM 1692, NEW YORK 5, NEW YORK. FREE TO THE PERSONNEL OF USERS OF CUTTING OILS.**



★ O I L I S A M M U N I T I O N — U S E I T W I S E L Y ! ★ ★



## Much Tighter Labor Controls for West Coast Plane Builders

*The New Program, Which It Is Hoped Will Add 100,000 Aircraft Workers, Applies Also to Ship Builders*

Aircraft companies on the Pacific Coast probably have felt the effects of the draft and the general tightening in the manpower situation more acutely than any other segment of U. S. industry. Recognizing the threat to military airplane production, Selective Service officials have deferred all aircraft workers in California, Washington and Oregon until Oct. 1 pending further action. An estimated 250,000 single and childless married workers are affected by this order. Supplementing this move, James F. Byrnes, Director of OWM, has put into effect, beginning September 15, a comprehensive program for the West Coast Aircraft and Ship Building Industries establishing much tighter labor controls. In announcing the program, which it is hoped will add 100,000 aircraft workers, Byrnes said, "We already have fallen behind schedule for vitally important war items on the West Coast due to the manpower shortages. It is obvious that drastic measures are required to increase the available labor supply on the West Coast and to insure the most efficient and economical use of the available labor supply."

This new program, similar to one inaugurated in Buffalo several months ago, is administered by the WMC. It calls for adjustment of production schedules by WPB to meet the available labor supply, establishment of manpower priorities and allocations on the basis of urgency, review of all proposals for new facilities and contracts involving increased employment, and removal of war production from the West Coast where it will be advantageous to the war program. Broad powers also are given the WMC to encourage transfer of workers from less urgent work by direct recruitment and by authority requiring releases.

Labor turnover has admittedly been a big factor in the manpower difficulties of the West Coast aircraft plants. Turnover has averaged 6½ per cent per month for these plants. In the first six months of 1943 the aircraft companies had to hire 150,000 employees to effect a net gain of 12,000 workers. Consolidated Vultee, one of the largest West Coast companies, averaged 7.47 per cent monthly turnover for the four months ending with June.

Requiring workers to get availability

certificates from their employers before being allowed to take new jobs has not worked out practically because disgruntled employees did not help production or they were willing to be idle during the 30-day waiting period required before signing up for a new job. Stricter enforcement of WMC

hiring procedure, which will include a 60-day waiting period by Oct. 15 for those quitting aircraft jobs, has been proposed. Other suggestions to help the manpower situation are improvements in transportation, better housing accommodations, improved food rationing and shopping facilities for workers and added incentive pay for night shifts. Both Boeing and Consolidated Vultee asked permission to recruit 5,000 additional workers from the Midwest but the government considered lack of housing a bar to such a move and would not approve new housing projects. The aircraft companies also are seeking group deferment of key

(Turn to page 80, please)

## Increased Capacity May Release More Steel for Civilian Needs

*Strain of Uninterrupted Steel Production More than Offset by Additional New Manufacturing Facilities*

By W. C. Hirsch

Apprehension that the strain of uninterrupted operations since the outbreak of the war will make itself more and more felt in the steel industry from now on, necessitating the reconditioning of some furnaces and rolling mills, is more than offset by the scheduled early going into production of additional new capacity. It is this

angle that forms one of the principal arguments of the advocates of maximum expansion of production facilities regardless of its effect on the post-war set-up. Like so many other problems, the need of the hour rather than any inflexible policy appears to furnish the answer. Timing of relining of furnaces and repairs of mill

(Turn to Page 56, please)



**Morris Mark 1 Light Reconnaissance Car**

*This British reconnaissance car has a shell of welded armor plate and is equipped with a manually operated, open topped, revolving turret. It offers good protection to the driver who sits in the center and has a bullet-proof lookout. A Bren gun and a Boys anti-tank gun are carried for either anti-aircraft work or ground strafing. Acme photo.*



## HELPING HIM FIGHT!

—by fighting gas and oil waste

EVERY American, because he believes in Liberty, sincerely wants to aid the fighting men of United Nations. Conserving precious rationed gasoline and oil is one of the most vital services our industry can render.

But the painstaking engineering thought back of your original piston and ring assembly specifications is all too often nullified by hit-or-miss choice of ring types during overhauling.

Sealed Power *Individually Engineered* replacement Piston Ring sets follow your specifications faithfully, with carefully calculated and *proved correct* modifications for wear.

Sealed Power's wartime messages to the hard-pressed service mechanics who must keep the vehicles you've built at top efficiency, continually stress the great importance of this feature.

**SEALED POWER CORPORATION**  
MUSKEGON, MICHIGAN • WINDSOR, ONTARIO



**BUY AT LEAST ONE  
EXTRA \$100 WAR  
BOND THIS MONTH**

•  
You owe it to yourself—  
to America—to that special  
man of yours in uniform

**SCRAP METAL  
IS NEEDED FOR  
EVERY GUN,  
TANK AND  
SHIP. SEND  
YOUR SCRAP  
TO WAR.**

**PISTON RINGS—PISTONS—CYLINDER SLEEVES**

# Cadillac Building Tank Engines With Hydramatic Transmissions

*Improved Rolls-Royce Aircraft Engines Being Built  
by Packard. Aircraft Production Not Up to Schedule*

Application of the automatic transmission to tank propulsion, with a consequent improvement in efficiency and maneuverability, has been revealed with the announcement that Cadillac Motor Car Division of General Motors is installing two Cadillac V-type 8-cylinder

engines and two hydramatic transmissions in the M-5 light tank which it is manufacturing. The automatic transmission makes the tank easier to operate at sustained speeds and over hilly terrain because the driver is not distracted by manual gear shift opera-

tions. It also eliminates jerky starts. The 150-hp engines are mounted side by side and the hydramatic transmissions operate through a transfer unit.

First production tanks equipped with the hydramatic drive came off the Cadillac line in May, 1942. M-5 tanks played an important part in the North African invasion. Army officials rate the Cadillac-powered M-5 as the fastest tank in action on any front. It is armed with a 37-mm. cannon and three machine guns. Service problems on the M-5 tank are simplified because more mechanics are familiar with the liquid-cooled automotive engine than with the air-cooled aircraft type, say Cadillac officials. Except for minor installation fittings dictated by tank design, the Cadillac V-8 engine was virtually unchanged and likewise, only a few minor changes were necessary in the hydramatic transmission.

Battle conditions continue to bring changes on the war production front. Manufacture of one type of amphibian vehicle is being discontinued as the result of experience in the Allied landings on Sicily.

Packard Motor Car Co. has been in volume production for several months on the Rolls-Royce aircraft engine incorporating a two-speed, two-stage supercharger. The supercharger enables this engine, which makes the North American P-51-B Mustang a high altitude fighter, to deliver 600 additional hp at 30,000 ft. Horsepower is stepped up to better than 1,500, according to G. T. Christopher, Packard president. Some improvements in the engine have been made to increase the safety factor, including

(Turn to page 76, please)

PHOTO BY U.S. ARMY SIGNAL CORPS.



**Constant Research plus Rigidly  
Controlled Production is Producing  
More Efficient Sterling Pistons for:**

**Tanks  
Trucks  
Airplanes  
Busses**

**Marine Engines  
Passenger Cars  
Motorcycles  
Utility Engines**

Write today if our years of experience in creating aluminum pistons can help you solve your problems.

**Sterling Aluminum Products Inc.**  
Saint Louis Missouri



**STERLING**  
PISTONS



## Awards

Names and winners of Army-Navy "E" awards in or allied with the automotive and aviation industries, announced since the Sept. 1 issue of *Automotive and Aviation Industries* went to press.

**BENDIX AVIATION CORPORATION**  
(Owosso Division), Owosso, Mich.  
**BURLINGTON MILLS, INC.**, Burlington, Wis.

**CALLITE TUNGSTEN CORPORATION**, Union City, N. J.

**CARBOLLOY COMPANY, INC.**, Detroit, Mich.

**CRITERION MACHINE WORKS**, Beverly Hills, Cal.

**DOUGLAS AIRCRAFT COMPANY, INC.**, Long Beach, Cal.

**GENERAL MOTORS CORPORATION** (two plants).

**HELLER BROTHERS COMPANY**, Newcomerstown, Ohio.

**LaSALLE STEEL COMPANY**, Hammond, Ind.

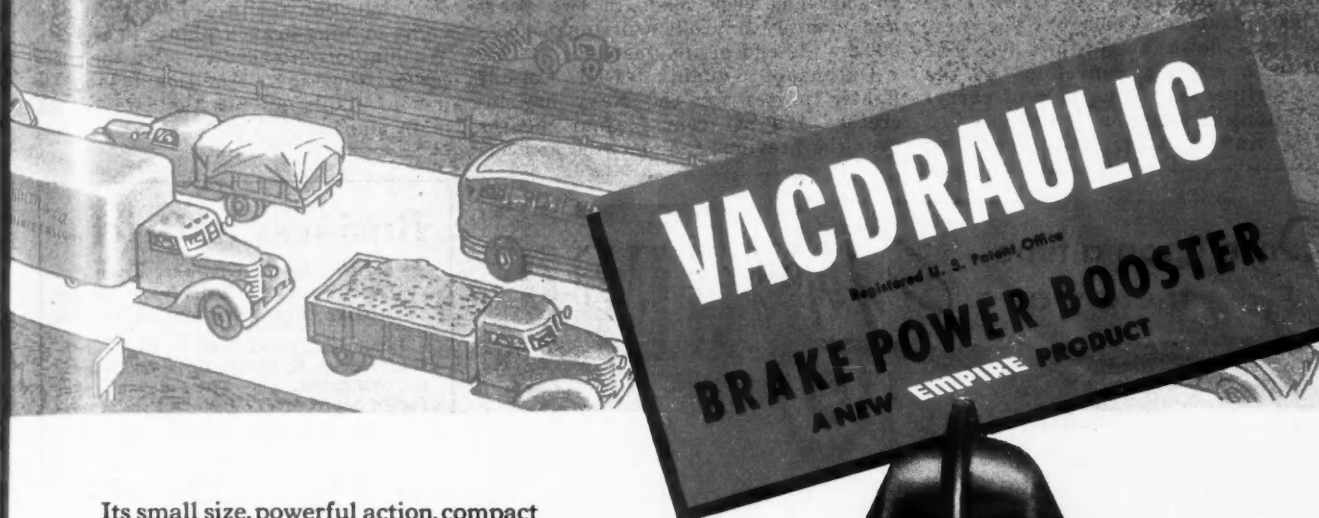
**LINK BELT COMPANY**, Caldwell Plant, Chicago, Ill.

**NATIONAL ENAMELING & STAMPING COMPANY**, Milwaukee, Wis.

**TULSA WINCH MANUFACTURING COMPANY**, Tulsa, Okla.



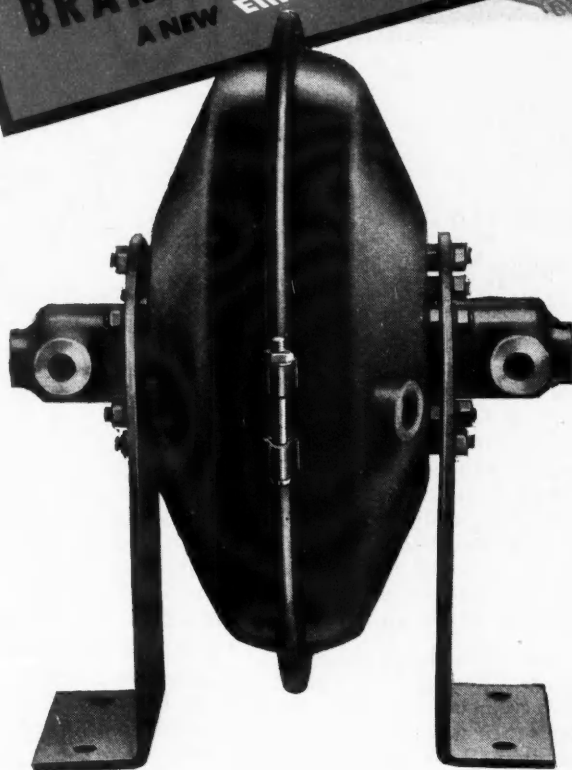
TRUCKS • TRAILERS • BUSES • PASSENGER CARS



Its small size, powerful action, compact construction and ease of installation make this the ideal device for multiplying the power of any hydraulic brake.

Operating on an entirely new principle, the Vacdraulic Brake Power Booster is a ruggedly built, self-contained unit, actuated by intake manifold vacuum. It can be attached at any convenient point along the hydraulic line. By its use the braking power of any hydraulic brake system on a truck or bus is multiplied three or four times. There are no mechanical connections to be damaged or to cause an operating lag.

The driver always gets the proper "feel" from the brake pedal. The brake action is simultaneous with the pedal movement both in its application and in its release. Vacdraulic Brake Power Boosters are available for new installations or replacements within the limits of W.P.B. regulations.



Engineering data on both devices, and full information on the new operating principle of the Vacdraulic Booster, will be furnished on request.

**ELECTRIC**  
Soc 14th Street

**EMPIRE**

**BRAKE CO.**  
Newark 7, New Jersey

## War Plant Expansions

Douglas Aircraft Co., Inc., has produced its 2000th military cargo and troop transport plane since the start of the war. The C-47 twin-engined Skytrain is a military version of the DC-3 commercial airliner. A day's output now equals a week's production of a few months ago. Douglas also is getting into production on the C-54 four-engine Skymaster at a new \$33,000,000 plant at Chicago. The first plane was flown away July 30. The C-54 is a military conversion of the DC-4 airliner and is capable of carrying 15 tons of cargo or 50 soldiers.

The Kansas City, Mo., plant of

North American Aviation, Inc., will produce more B-25 bombers in 1943 than any other medium bomber plant in the world and its output will be almost as large as the entire quantity of military aircraft built annually in the U. S. a few years ago, according to President J. H. Kindelberger. Output in May, June and July was nearly five times as great as in the same period of 1942. Total plant expenditure of \$126,000,000 has been made in two years and monthly payrolls will top \$5,000,000 by the end of the year.

Output of Vought F-4-UI Corsair fighter planes for the Navy has increased 119 per cent in four months over the previous four months and has

exceeded schedules, according to Rex B. Beisel, general manager of the Chance Vought Aircraft Division of United Aircraft Corp. In the seven months ending July 31, Corsair production was up 96 per cent over the previous seven months. A new final assembly bay and facilities for flight testing have been expanded at the Stratford, Conn., plant.

Boeing Aircraft Co. plans to expand its production facilities by establishing eight or nine branch plants in western Washington in order to solve the manpower shortage. Additional labor is not available at Seattle, site of the main plant.



Once upon a time there was a little "Jeep"—but the rest of that story needs no telling, for no one piece of war equipment has won undying fame so quickly, nor endeared itself to the hearts of all fighting men than has the "mighty midget" shown above. But—take another look—for just above it is another already famous Jeep, the Jeep with wings, the "skeeter-bug" of the air.

This miraculous new Army plane is the Sentinel, or "Flying Jeep," perfected and produced by Consolidated-Vultee's Stinson Division at Wayne, Michigan. This is the plane which has become as integral a part of the U. S. Field Artillery as the big guns which roll into position beneath it. It is the "eyes upstairs" of all Army Ground Forces. It is the "finger man" that is putting the Japanese gangsters on the "spot."

May We Put Our Shoulder to the Wheel You Are  
Turning on the Road to Victory?

# McAleer

**MANUFACTURING CO.**  
*Quality-Controlled Finishing Materials*  
**ROCHESTER, MICHIGAN**

## Business in Brief

*Written by the Guaranty Trust Co.,  
New York, Exclusively for AUTO-  
MOTIVE AND AVIATION INDUSTRIES*

Business activity as a whole continues close to the peak, showing only minor fluctuations. The seasonally adjusted index of *The New York Times* for the week ended Aug. 21 stands at 141.6, as against 143.2, a new record figure, a week earlier and 131.6 a year ago.

Department store sales reported by the Federal Reserve Board for the week ended Aug. 28 were 1 per cent larger than in the corresponding period last year. This compares with a gain of 14 per cent reported a week earlier. Sales for the four weeks ended Aug. 28 were 6 per cent above the figure a year ago.

Railway freight loadings in the week ended Aug. 28 totaled 904,007 cars, 1.4 per cent above the figure for the preceding week and 0.5 per cent greater than the comparable total in 1942.

Electric power production increased contra-seasonally during the week ended Aug. 28 and was 18.7 per cent larger than in the like period a year ago. The comparable gain reported for the preceding week amounted to 16.1 per cent.

Crude oil production during the week ended Aug. 28 averaged 4,196,250 barrels daily, 22,100 barrels below the figure for the preceding week and 227,750 barrels under the total recommended by the Petroleum Administration for War.

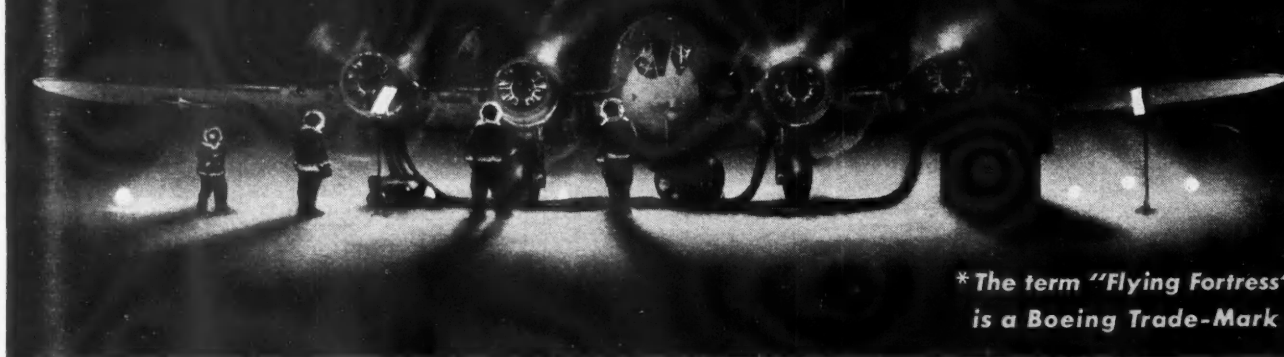
Bituminous coal production during the week ended Aug. 21 averaged 1,992,000 tons a day, as against 2,000,000 tons in the preceding week and 1,871,000 tons a year ago.

Engineering construction contracts awarded during the week ended Aug. 26 totaled \$40,638,000, according to *Engineering News-Record*, as compared with \$41,648,000 a week earlier and \$217,798,000 in the corresponding period last year. Total contracts for the year to date are 67 per cent below the comparable 1942 figure.

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 27 stands at 110.5 per cent of the 1926 average, as against 110.4 for the preceding week and 107.4 a year ago.

Member bank reserves increased \$213,000,000 during the week ended Sept. 1, and excess reserves rose \$40,000,000 to an estimated total of \$1,150,000,000. Business loans of reporting member banks declined \$1,000,000 during the preceding week and stood \$920,000,000 below the total a year earlier.

## WHAT HAPPENS TO OIL COOLER TUBES...



\* The term "Flying Fortress"  
is a Boeing Trade-Mark

## WHEN A "FORTRESS" WARMS UP FROM AN ARCTIC COLD START?

Imagine the severe pressures that oil coolers must stand when airplane engines start up after standing in sub-zero cold. Actually, pressures up to 300 lbs. per square inch are thrust against the walls of the tubes. But Winchester Cartridge Core Tubes safely withstand them... keep Flying Fortress\* oil cooling systems safe from clogging, leaking, freezing or overheating.

Made of pure copper, with walls only 6/1000ths of an inch thick, Winchester Radiator Tubes, thanks to Winchester's COLD copper-extrusion process, are seamless and so assembled that *their entire outer surface is cooling area.*

### HARDER JOBS WANTED FOR THESE SENSATIONAL TUBES •

No War Baby, Winchester Cartridge Core Tubes have 25 years of service behind their performance. They offer these spectacular features:

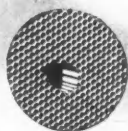
Of pure copper, thus corrosion-proof • Seamless,—safe against leaks • Coolant on outside—no damage from freezing • 1,728 cartridge core tubes per square foot • Avoid waste space in radiator assembly—minimum of solder • Permit tailoring radiator to fit any dimension or design • Provide up to 25% greater cooling per square foot than others.

WINCHESTER REPEATING ARMS COMPANY  
New Haven, Connecticut  
Division of WESTERN CARTRIDGE COMPANY

# WINCHESTER

TRADE MARK

"On Guard for America Since 1866"



DAMAGED TUBES ARE PUSHED OUT



NEW TUBES ARE INSERTED



SOLDERING COMPLETES REPAIR



If out of your engineering knowledge, experience, research and skill you are contemplating a new fighting machine for Uncle Sam... are dreaming up a startling new post-war automobile, or similar product, write Radiator Division, Winchester Repeating Arms Company, New Haven, Connecticut.

COPR., 1943, WINCHESTER REPEATING ARMS CO., DIV. OF WESTERN CARTRIDGE CO.



## Increased Capacity May Release More Steel

(Continued from page 48)

equipment has been so improved that a minimum of production loss ensues. Virtually no piece of machinery is allowed to operate so long that its overhauling would entail more than the minimum of idleness for reconditioning. In this way considerable has been contributed to the lessening of pressure of demand. New plant capacity to be completed in the next five months is expected to add some six million net

tons to the approximate current output rate of 90,000,000 tons a year. Even under war conditions, this increase in capacity may permit of the allocation of more liberal tonnages to those civilian needs to which war requirements now deny consideration. The increased supply available may also ease the strain of the transition period for the automobile industry. The full effect of the steel industry's increased capacity is difficult to gage in view of the uncertainty of the labor supply in general and especially of that in the steel and steel consuming industries. In some descriptions of steel, especially so in

electric furnace products, the added capacity will relieve to a marked extent prevailing congestion, thus being of special benefit to aviation industry consumers. Report has it that steel mills have become much more exacting than formerly in insisting that scrap tendered to them for acceptance conform to the most rigid specifications. Rejections are said to have become more numerous than acceptances. The U. S. Bureau of Mines recently reported a slight increase in scrap stocks, but the supply outlook for the winter months is none too reassuring.

It is interesting to note that at a luncheon meeting to be held at the Savoy Hotel, London, on Sept. 22, preparations for resumption of business by the London Metal Exchange after the war are to be considered. There was a time when virtually the prices of all non-ferrous metals were "made" on the floor of the London Metal Exchange. In the years that followed World War No. 1 this was hardly true. American marketers of copper respected London Metal Exchange quotations as expressive of the relation of the world supply to the demand, but the then growing competition of South African producers was far more of a source of anxiety to them than doings on the London Metal Exchange, which, moreover, lost much of its influence when the International Tin Cartel came into being and established the price of tin, in which the Dutch East Indies, Federated Malay States, and Bolivia had their say. Staging of a post-war come-back by the London Metal Exchange will evoke the best of wishes in the New York metal market without any thought of its dollar-and-cents significance.

## Obituary

Harry C. Tillotson, 76, founder and president of the Tillotson Mfg. Co., died suddenly Sept. 1 at Toledo. He worked on the development of the Tillotson carburetor from 1905 to 1914 while selling automobiles and bicycles in Chicago. He went to Toledo in 1914 and established the company which bears his name.

Albion James Wadhams, 68, of Dongan Hills, Staten Island, N. Y., a vice-president and manager of the Development and Research Division of The International Nickel Company, Inc., in New York, died at his summer home at Elizabethtown, N. Y., on Sunday evening, Aug. 22, of a heart attack. He had been with The International Nickel Company and its predecessor companies since 1901 and had been a vice-president of the company since Oct., 1935.

George W. Crist, 59, Detroit resident engineer of the Cleveland Graphite Bronze Co., died suddenly Aug. 28 at Detroit. He was an automotive engineer with the EMF Motor Co., Studebaker and General Motors before joining Cleveland Graphite Bronze in 1926. He was a member of the SAE.

# TUBING

From a Test Tube

# SARAN\*

TUBING  $\frac{1}{8}$ " to  $\frac{3}{4}$ " • FITTINGS  $\frac{1}{8}$ " to  $\frac{3}{4}$ "  
PIPE  $\frac{1}{2}$ " to 4" • SHEETS  $\frac{1}{64}$ " to  $\frac{3}{8}$ "  
MOLDED PARTS

From the genius of chemistry's test tubes has come Saran... a thermoplastic resin which is doing a remarkable wartime job in many tubing applications. Saran Tubing has high tensile strength, extreme resistance to most acids and metallic alkalis, resistance to heat up to 180°, and other notable characteristics which qualify it to replace critical metal tubing.

In the automotive and aircraft fields Saran is making a good record for itself in uses such as gasoline lines, air conditioning and refrigerant tubing, etc. . . . doing a *better* job than metal on many of them. Write for an engineering bulletin with full data.

Acadia Synthetic Products Division  
**WESTERN FELT WORKS**  
Chicago, Illinois: 4035-4117 Ogden Avenue  
Detroit, Michigan: 420 Stephenson Building  
Branch Offices in All Principal Cities

# ACADIA

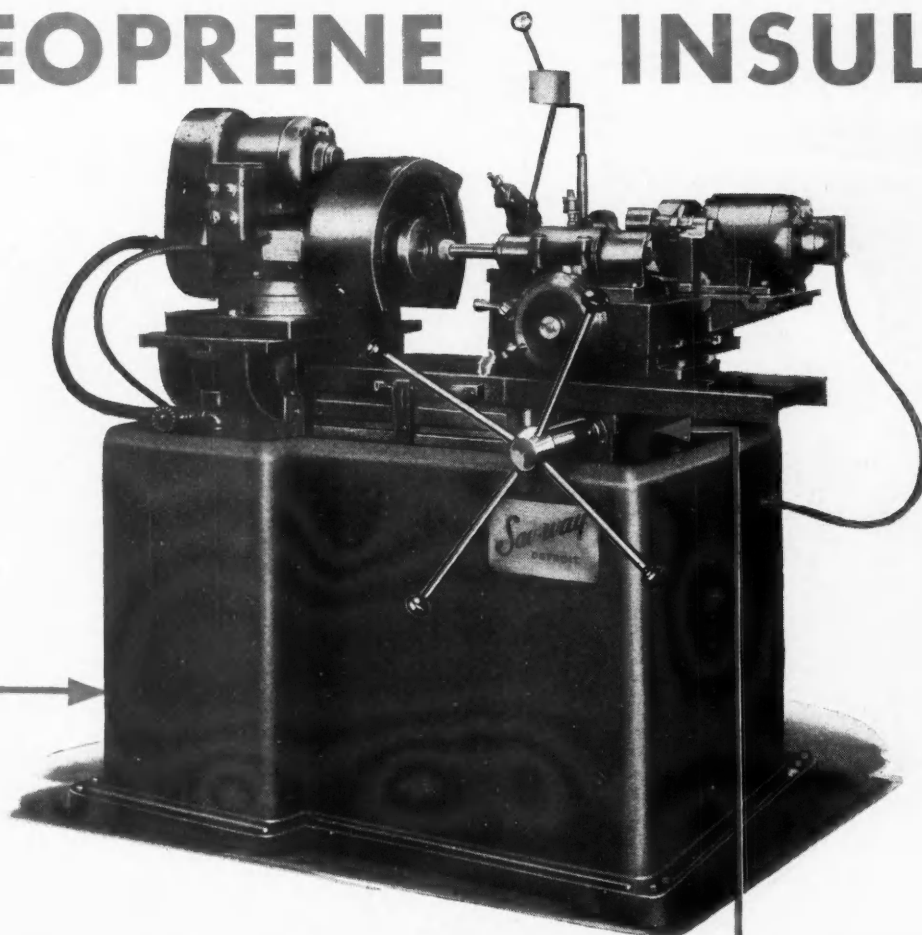
Processors of Synthetic Rubber and  
Plastics • Sheets • Extrusions •  
Molded Parts

# Synthetic PRODUCTS

\*Licensee of The Dow  
Chemical Company

WESTERN  
FELTS  
Largest Independent  
Manufacturers  
and Cutters of Wool,  
Hair and Jute Felts

# NEOPRENE INSULATED



## against Vibration, Distortion, Misalignment!

This radical departure from conventional design gives the Sav-Way multi-purpose internal grinder a new permanence of alignment and resulting higher accuracy. The bed proper is a thick surface-plate type normalized alloy iron casting of heavily ribbed whale-back construction. Neoprene pads between the bed and the steel base eliminate metal-to-metal contact and absorb floor vibration, preventing distortion of the base being transmitted to the bed, which is accurately scraped. This is only one of seventeen specific features which make the new Sav-Way M-1-A Grinder outstanding in design and construction.

For complete description and specifications, attach the coupon to your letterhead.



**Send the Coupon  
for Your Copy**

KEEP AN EYE ON

**Sav-Way INDUSTRIES**  
★ Machine Tool Division ★  
4875 EAST EIGHT MILE • DETROIT, MICHIGAN

PRODUCERS OF SAV-WAY HAND AND HYDRAULIC INTERNAL GRINDERS • SAV-WAY GOLD  
REAL SPINDLES • PLUG GAGES • PRECISION AIRCRAFT AND AUTOMOTIVE PARTS

SAV-WAY INDUSTRIES, 4875 E. 8-Mile Road  
Detroit, Michigan

Kindly send me a copy of the illustrated folder  
describing the Sav-Way M-1-A Internal Grinder.

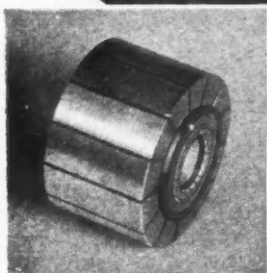
Name

Position

Firm

Address

City  State



Many of these parts are less than one inch in diameter, the thin separations around their edges are reflected upon the screen at 22 magnifications, and inspected for perfect alignment.

*Courtesy Westinghouse Electric & Manufacturing Company*

# INACCURACIES



**T**HESE small commutators for aircraft radio sets were examined with a magnifying glass until the Westinghouse Electric & Manufacturing Company installed **Jones & Lamson Optical Comparators** for the inspection of these parts.

Now they are inspected rapidly, positively and with less fatigue. Moreover, production was in-

## in Vital Airplane Parts are ELIMINATED by inspection with Jones & Lamson Optical Comparators

creased by 20 per cent.

Many other farsighted manufacturers have discovered the practical advantages of inspection by optical projection, after consulting Jones & Lamson inspection engineers. They are always ready to study your problems and make recommendations based on more than twenty years experience in this field.



# JONES & LAMSON

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies

MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.  
Profit-producing Machine Tools



## Two Kinds of Carpet-bagging



"The Federal Government has more employees in every State than the State itself has. Where State rights go out, carpetbaggers come in."—Robert Quillen.

## Sterling Commemorates 25th Year of Business

No special anniversary celebration was held last month at Sterling Aluminum Products, Inc., St. Louis, Mo., to commemorate the twenty-fifth continuous year of business, since the firm is engaged entirely in the production of direct or indirect war materials. Instead of "time out," additional production was sought on aircraft, automotive and tank parts which are produced and completely manufactured by Sterling.

The company is currently pouring over a million pounds of aluminum per month, and, according to a recent report of the Office of War Information, Sterling produces 15 per cent of America's permanent mold aluminum castings.

## Improved Engine for P-51 Mustang Fighter

The latest North American P-51 Mustang fighter, equipped with the new Packard-built Merlin engine for high altitude fighting, is being produced in quantity at North American's California and Texas divisions, it was disclosed by J. H. Kindelberger, president of the aircraft company.

Although it previously had been announced that the Merlin powered fighter would supplant the original Mustang in production, Kindelberger amplified details concerning the new fighter being built for the American and British air forces.

Top speed of the new Mustang and exact figures on the altitude to which the plane is capable of climbing are military secrets. However, the original Mustangs were listed in the "above 400-miles-per-hour" speed category.

Decision to equip the Mustangs with the Packard-built engine resulted from the increase in high-altitude bombing by the United States Army Air Forces. The Merlin engine now used in the Mustang utilizes a two speed, two stage supercharger, and drives a constant speed, four-blade Hamilton Standard propeller. This power plant and propeller equipment will enable the Mustang to accompany American bombers and protect them effectively at tremendous heights, Kindelberger said.

In order to produce the new Mustang in large quantities in its Texas division, the company is gradually tapering down on production of Texan combat trainers.

## New Toluene Plant

Standard Oil Company of Indiana's new toluene plant at its Whiting, Indiana, refinery is now completed and will shortly be shipping more toluene for manufacture into TNT for bombs for America's war planes than all sources in the United States produced in World War I, the company revealed in a "Progress Report" mailed with dividend checks to 96,000 stockholders.

Standard of Indiana will also rank as one of the leading producers of 100-octane aviation gasoline with the construction of other new units, most of which will be completed by the end of this year, the report states.

## Improved Design ROTARY SHEAR

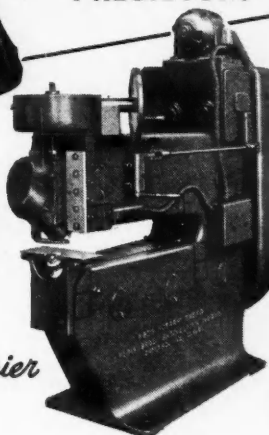
DOES THE WORK  
OF MANY MACHINES



Amazing  
PRECISION!

INCREASES  
PRODUCTION!

Better...Quicker...Easier  
FAR LESS COST



Here, is possibly the most amazing rotary shear you have ever seen. Its revolutionary design and construction give you EXTRA features and many advantages over other type rotary shears. Remarkable for its numerous applications, it does the work of many machines—quickly and economically, when provided with the proper attachments. Does not require skilled operators. *Anyone can operate it!* Of rugged construction, with double hardened cutters and V belt drive that absorbs jolts, it shears without burrs and with hair line precision. Cuts mild steel up to 1 inch thick, alloy metals in proportion to hardness. Many other special features such as anti-friction, high-speed bearings, oil bath gearing, friction clutch, wear resistant alloy steel parts, result in a unit that decreases operating costs, maintenance upkeep and provides a longer over-all efficiency. Learn how. Get further details and specifications . . . . .

**KLING BROS. ENGINEERING WORKS**

Dept. A-9, 1300 N. Kostner St., Chicago 51, Illinois

**KLING ROTARY SHEARS**

DOES ALL THIS  
WORK FOR YOU

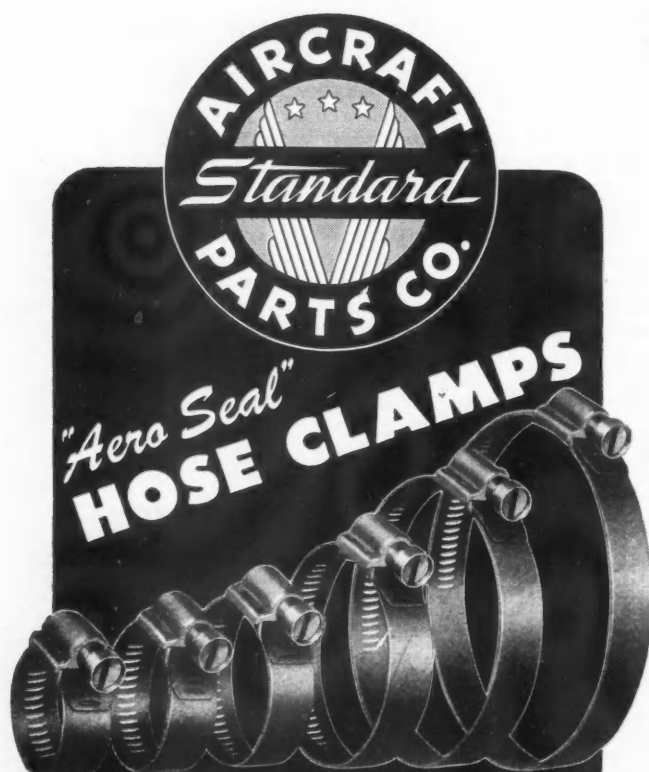
- 1 CUTS STRAIGHT LINES
- 2 CUTS RINGS—SMALL OR LARGE RADIUS
- 3 CUTS CIRCLES
- 4 MAKES FLANGES
- 5 CUTS INSIDE HOLES WITHOUT CUTTING IN FROM EDGES
- 6 JOGGLES & OFFSETS
- 7 CUTS ODD SHAPES
- 8 BEVELS OF ANY ANGLE
- 9 CUTS REVERSE CURVES
- 10 BEADS & U'S

ALL WITH  
Hairline  
PRECISION

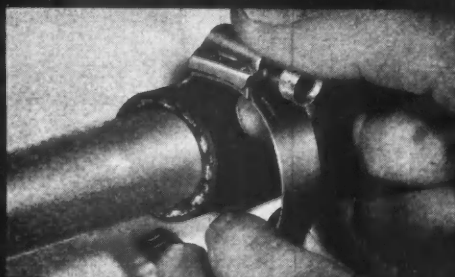
FREE!

Write today for  
FREE bulletin  
No. 243. No  
obligation  
or cost.





- EXTREMELY COMPACT
- RAPID ACTION
- UNIFORM PRESSURE ON HOSE
- NO LOOSE PIECES
- SELF-LOCKING
- SMALL NUMBER OF SIZES
- 3" TAKE-UP IF NEEDED
- SAFETY CUP ON SCREW HEAD
- COMPLY WITH AAF SPECIFICATIONS



CAN BE INSTALLED OVER HOSE IN PLACE ON PIPE—NO LOOSE PIECES

A new and better hose clamp for the aviation industry. Compact, convenient, easy to operate, strong, quality-built, and durable. Operates on worm and worm-gear principle. Write for circular giving complete data and prices.

**AIRCRAFT STANDARD PARTS CO.**

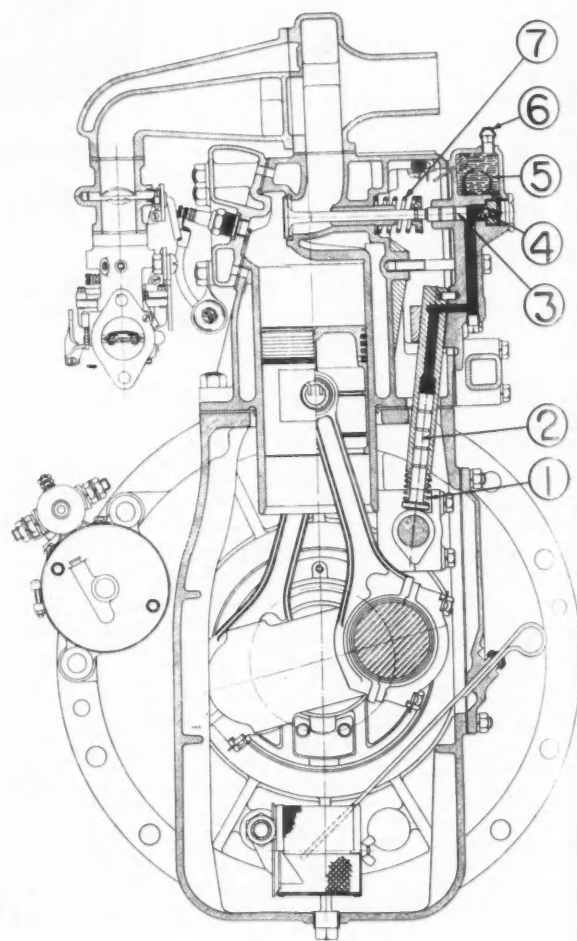
1711 19th Ave., Rockford, Illinois

## Hydraulic on the M-M

**A**N INTERESTING application of a hydraulic valve actuating device, providing freedom from backlash, has been incorporated in all recent production engines of the Model OEA tractor type engine built by the Minneapolis-Moline Power Implement Co. As may be noted by reference to the illustration, a unique feature of this device is that there is actually no mechanical connection between the valve lifter and valve.

As illustrated, the movement of the valve tappet is transmitted hydraulically to a plunger which operates directly on the end of the valve stem. The hydraulic system is fed from the oiling system of the engine, replacement of oil leakage in the valve circuit being taken from the engine supply. No valve adjustment is needed with this mechanism. The M-M hydraulic valve lifter contains only four moving parts which have the following functions, referring to the illustration:

A. The tappet (2) follows the contour of the cam



# Valve Lifter Tractor Engine

and moves the column of oil in proportion to cam rise.

B. The spring (1) rides on the tappet. If the engine is stopped with the tappet on the nose of the cam, the oil can be forced out around the plunger (3) by the pressure of the valve spring (7). Upon starting the engine, the spring (1) causes the tappet to follow the cam and in so doing, oil is drawn in through the check valve completely refilling the system.

C. The plunger (3) operating on the end of the valve stem is actuated by the column of oil set in motion by tappet (2).

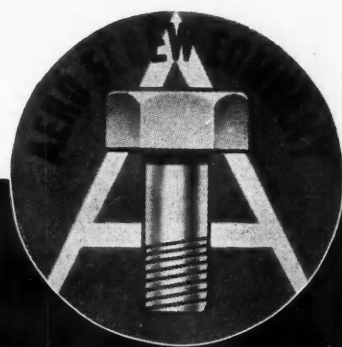
D. The check valve (4) allows oil to enter the oil column between tappet (2) and plunger (3) from the sump (5). The oil sump is connected by a tube (6) to the pressure side of the engine oil pump. This pressure acting constantly on the check valve (4) keeps the oil column filled while the engine is operating.

It will be observed that even if the spring (1) were removed, the engine could be started by turning the engine over by crank or starting motor until the oil pressure in the sump (5) became high enough to force oil through the check valve (4), thereby replacing the oil that had been forced out around tappet (2) or plunger (3). The wire protruding from the oil sump (5) into the cylinder block is in a close fitting hole and serves to allow the air to bleed out of the oil sump. The wire vibrating in the hole prevents it from becoming clogged by foreign matter.

## NAPD Moves to Larger Quarters

Owing to the ever-expanding list of membership, the National Association of Personnel Directors has moved its executive offices from 20 West Jackson Boulevard to larger quarters at One North LaSalle Street, Chicago. The association was founded by a group of Middlewestern personnel directors who saw the need for a national clearing house for personnel administration. Today, the membership, headed by Tom O. Armstrong of Westinghouse Electric and Manufacturing Company of Springfield, Mass., includes the bulk of the nation's leading personnel men and women from coast to coast.

Mr. Armstrong, the president of the association, has been connected with Westinghouse Electric and Manufacturing Company for approximately 18 years in the various capacities of foreman, purchasing agent, office employment manager and supervisor of industrial relations. Today he is located in the Springfield, Mass., plant as manager of industrial relations.

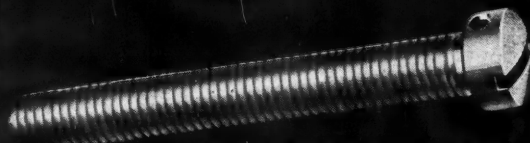


**SEE  
"AEROSCREW"  
FOR...**



### STEEL DRILLED HEAD AIRCRAFT BOLTS

Generally known as "Engine Bolts" and widely used in aircraft construction where bolts with heads drilled to accommodate lock wire are required. Holes drilled through all faces to meet center hole in top of hexagon head. Made of heat-treated nickel steel to conform with Army-Navy specifications, in types AN73 through AN81 and sizes up to 6" length. Also in coarse thread (NC3) or fine thread (NF3) styles. Carefully inspected and tested for quality, accuracy, and uniformity. Cadmium plating conforms to AN-QQ-P-421. Identified by "X" on head.



### DRILLED FILLISTER HEAD MACHINE SCREWS

Used in many assembly operations and hence available in several types and a wide range of sizes. Low-carbon screws, for ordinary uses where high strength and close tolerances are not required, made to Air Force drawings AC500A and AC501A. Heat-treated nickel steel screws, for more particular applications where screws are appreciably stressed, conform to Army-Navy drawings AN502 and AC503. For close positions, where double cross-drilling is desirable, nickel steel screws conform to Navy drawing NAF-1164. Plating is bright and uniform. Nickel steel items identified by "X" on head.

*We are Specialists . . .*

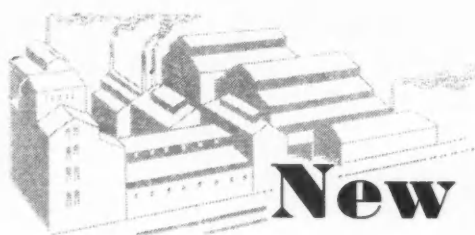
in the manufacture of selected items of aircraft hardware. In addition to the above, we can furnish high-quality Hexagon Head Bolts, Clevis Bolts and Pins, Washer Head Screws, and Threaded Taper Pins.

*Write for Catalog and Engineering Data*

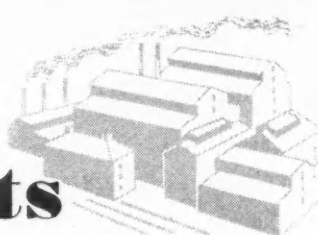
**AERO SCREW COMPANY**

19th Ave. at 12th St., Rockford, Illinois





## New Products



### Plastic Sheeting Coated with Adhesive

To protect valuable maps, the Army supplies its officers with rolls of Lumarith plastic sheeting coated on one side

with a pressure sensitive adhesive. The officer simply cuts it to size, strips off the backing, lays the Lumarith over the map to be covered and presses down firmly. The result is perfectly transparent, moisture-proof, grease-

proof, dust- and sand-proof protection for the map.

Two surfaces are available—one a clear surface Lumarith which can be written on with a china or grease pencil, and the other a mat finish developed especially for the Army, which can be written on in pencil, crayon, or ink. Lumarith is a product of the Cellanese Celluloid Corporation, New York, N. Y.



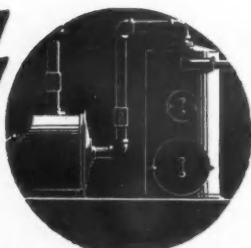
## ENLISTED?

Some of the men who cleaned your office or plant have probably gone by now. But those plants having Spencer Vacuum Cleaning now use inexperienced men or women and continue the necessary standards of cleanliness at all times.

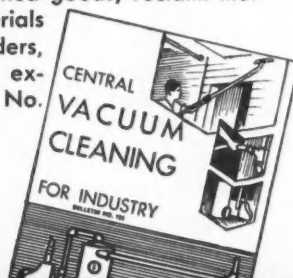
With mass production and its resulting dust and debris, cleaning is more necessary than ever — to clear the way for continuous production, to protect workers against dust and explosion and to keep the lighting conditions up to standard.

Lightweight fast working Spencer Swivel handle vacuum tools, with tremendous vacuum power and the fact that debris is easily removed from the vacuum machine, are three reasons why Spencer Vacuum is used extensively in industry.

Spencer Portable and Stationary Systems are also used to clean machinery and finished goods, reclaim metals, and move materials such as sand, cinders, and sawdust. All explained in Bulletin No. 125. Ask for it.



243 N



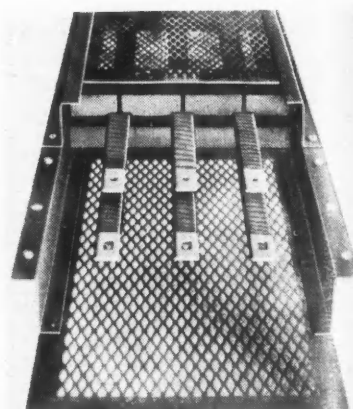
# SPENCER VACUUM HARTFORD CLEANING

THE SPENCER TURBINE COMPANY, HARTFORD, CONN.

### Ventilated Type Feeder Bus Duct

A redesigned Feeder Bus Duct of the ventilated type, having a screened casing of expanded metal in place of the solid metal casing formerly used, has been placed on the market by Bulldog Electric Products Co., Detroit, Mich.

While conserving critical steel and copper, it is claimed that the new design is more attractive in appearance and provides better performance as the complete ventilation afforded by the screen casing assures low operating temperatures and increased current carrying capacities. The paired-phase



**Bulldog ventilated type Feeder Bus Duct**

bus bar arrangement within the casing assures uniform current density through reduction of "skin effect" and "proximity effect."

The Feeder Bus Duct is available in the new WPB ratings of 800A, 1000A, 1250A, 1600A and 2000A single phase, 3 phase, and 4 wire 3 phase, 600 v or less. It can be used for Feeders alone or in conjunction with the company's branch circuit plug-in type Bustrubution Duct.

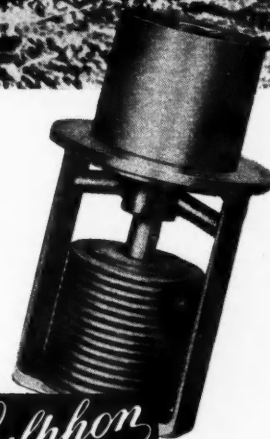
(Turn to page 104, please)

# JEEPS OR JUGGERNAUTS... They Rely On **SYLPHON** Thermostats



Rumor has it, new models to roll off Automotive assembly lines will have automatic shock-troop absorbers, all-welded turret tops, larger calibre axis persuaders, free-flank-wheeling devices—and, seriously, Sylphon Thermostats, as usual, to insure exact motor temperatures necessary for peak performance at all times in the supreme test of mechanized combat; maximum economy in fuel engine and lubricating oil; minimum engine wear and maintenance in the field.

The "Standard" Thermostat with the Automotive Industry in peace-time, proved by years of highly satisfactory experience, it is natural that these engineers should have turned to Sylphon Thermostats for the same all-out performance for the machines of war.



*Sylphon*  
TRADE MARK

**THE Standard  
THERMOSTAT**



**THE FULTON SYLPHON CO.**  
KNOXVILLE. TENNESSEE

*Temperature Controls... Bellows... Bellows Assemblies*

# Possibilities of Furnace Brazing in Aircraft Production

(Continued from page 29)

the optimum. The decrease in joint strength as its thickness decreases is due probably to the inability of the molten brazing metal to penetrate where the opposing surfaces are too close to each other. This inability to wet the entire surface reduces the effective area, and thereby reduces the over-all joint strength. The decrease in joint strength above the optimum

thickness is due probably to a decrease in the alloying effect.

The graph reproduced in Fig. 2 was prepared from pull-test data of butt joints of 18-8 stainless steel brazed with "Easy-Flo" (50 per cent Ag, 16 per cent Cu, 16 per cent Zn and 18 per cent Cd), but there is reason to believe that the trends which it indicates may apply to all brazing alloys, and to

shear as well as to tension joints. It is interesting to note that the joint strength approaches the strength of the parent metal at the optimum joint thickness, but that as the thickness increases beyond the optimum, the joint strength decreases to below the strength of the brazing wire. This is due probably to the fact that the brazing wire had a wrought structure, whereas the deposit in the joint had a cast structure.

It would be desirable to develop methods of controlling the joint thickness, since it seems to exert a critical influence on the joint strength. There appear to be two ways in which this thickness-control may be accomplished: 1. By holding the parts at a constant distance from each other; 2. By clamping the parts together with a constant force.

## 1. Constant Distance

The thickness of many joints can be controlled by machining mating parts to close tolerances. A typical example is the telescopic joint shown in Fig. 3. Tack-welded joints or special locating fixtures also may be used to constrain, with respect to each other, parts to be brazed. The principal disadvantage of a tack-welded joint is that it is difficult to maintain the desired separation of the parts with any degree of accuracy or consistency. Although very accurate fixtures can be made, repeated heating to the temperatures required for brazing may impair their accuracy. However, this difficulty no doubt can be eliminated by making adjustable fixtures, or by other means.

## 2. Constant Force

If a sheet of brazing alloy is placed between two parts to be brazed, the system clamped together with a constant force, and then heated to the brazing temperature, the thickness of the brazed joint will be some function of the clamping force. Determination of the clamping force that produces the optimum joint thickness would make it possible to insure high strength joints by clamping parts together with constant-force clamps.

An investigation to determine under what conditions each of the above methods of clamping is applicable would aid tool designers in determining the type of fixture required to braze an individual assembly. At the present time, a study of the production use of furnace brazing is being conducted by the Production Research Group. This investigation covers the ferrous and aluminum alloys and includes consideration of the strengths of various types of joint, and the development of suitable production tooling, specifications and inspection methods. Attention will be focused on furnace brazing, since this appears to be the most promising from a high-production standpoint. However, investigation may be made of other brazing methods if these appear to offer possibilities.

# WANTED

## Advanced thinking Engineers

Today's headwork will be the deciding factor in tomorrow's competitive markets. That's why we address this advertisement to advanced thinking engineers who are concerned with the design, development and use of gasoline and Diesel engines.

We want these men to know all about the VISCO-METER\*—the operating and selling advantages it adds to your product.

The VISCO-METER\* is *not* a new development—*not* a war baby. As a matter of fact, the VISCO-METER\* has been

in use since 1928. Fourteen prewar years have service-tested the VISCO-METER\* on well known makes of gasoline and Diesel engines operating under every conceivable condition.

With America's entry into World War II, our government drafted VISCO-METER\* production. This is further recognition of worth because several branches of Federal service had been using the VISCO-METER\* for some years.

VISCO-METERS should soon be available for peace time engines.

We have prepared a brochure fully illustrating the operation of the VISCO-METER\*. A copy is yours for the asking. In fact, a VISCO-METER\* engineer will be glad to visit your office, without obligation, if you will telephone, wire or write:

# VISCO-METER

CORPORATION

GROTE ST., BUFFALO, N. Y.

\*Fully covered by U. S. and Foreign Patents



## PUBLICATIONS

De Valt Products Corp. has issued a new folder on its **Light-Metal High-Speed Cutting machine**. Included in the folder are descriptions of the machine, illustrations and a page of general specifications.\*

A new, illustrated bulletin describing in detail its complete line of **Type E-O Balancing machines** has been issued by Thinius Olsen Testing Machine Co. It is Bulletin 26 and includes the principle of operation, construction, specifications, and other engineering details to enable a complete understanding of the application of Type E-O equipment to the balancing of rotating parts.\*

Continental-Diamond Fibre Company has issued Catalog DO 43, on **Dilecto**, a laminated phenolic plastic. The purpose of the book is to acquaint engineers and designers in industry with the properties of Dilecto, its manufacture and its uses. Complete engineering data are given.\*

A new 12-page booklet, **Safety Regulations for Women in Industry**, has been issued by General Electric Company.\*

A new handbook on **Plastacel** cellulose acetate plastic sheets has just been published by the Plastic Dept. of E. I. duPont de Nemours & Co. It describes in detail procedures and operations essential to the production of finished articles from this plastic substance.\*

A new handbook on the operation and maintenance of **magnetic pulleys** has been published by the Dings Magnetic Separator Co. The contents feature information on trouble-shooting, trouble prevention, repairs, recommended operating practices and general maintenance. The handbook is illustrated with drawings and diagrams and includes a number of simple formulae, a pulley selection table and other data.\*

Watson-Stillman has issued bulletin 250-A, offering a most comprehensive coverage of its line of **Stediflo Hydraulic Pressure Pumps**. The illustrations show several of the more popular models with separate illustrations of the important parts. Included is a full-scale sectional elevation drawing, a table giving dimensions, in inches, of the several sizes of pumps and a table of specifications covering details of each model and size.\*

Bulletin 350-A, just issued by Watson-Stillman Company, describes its line of **hydraulic laboratory presses and equipment**.\*

Facts about **Anti-Friction Bearings** is the title of a new 32-page book by Ahlberg Bearing Co. It tells why bearings are used, the function of each type of bearing, how loads are transmitted, etc. It contains many illustrations, diagrams, phantom drawings and photographs, together with explanations and descriptions in easy-to-read language.\*

National Broach & Machine Co. has issued a new folder on **Naloy steel** for broaches and other form tools.\*

The C-O Two Fire Equipment Co. has issued a new booklet describing its line of **portable and built-in carbon dioxide fire extinguishing equipment** and smoke detecting systems. It is illustrated and describes the application and operation of various kinds of C-O Two equipment.\*

The July-August issue of Oakite News Service, house magazine of Oakite Products, Inc., contains an article entitled **Spot Welding for Victory**, which is of special interest to production and process engineers, welding supervisors, foremen or other aircraft executives responsible for spot welding aluminum and aluminum alloys.\*

The Doall Co. has issued a new booklet on **Doall Precision Saws**. It contains a description of the contour saw laboratory, cutting rates, job selector charts, job selector dial, saw chart and selector various Doall precision saws, typical customer tests, etc.\*

A new booklet showing **Pneumix air**

**motored agitators** in use on different types of work has just been issued by the Eclipse Air Brush Co., Inc. In addition to illustrations, the booklet contains a catalog of these agitators that are operated by compressed air, and a price list.\*

Sciaky Bros. has published a new booklet describing and illustrating its **PMCO 2S-5 electric resistance welder** for aluminum and its alloys. Stored energy with preheating is described and illustrated; variable pressure cycle with precompression and charts showing how it operates; electrical features; mechanical features and a full page of specifications.\*

\*Obtainable by subscribers within the United States through Editorial Dept. Automotive and Aviation Industries. In making request for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.

## CALENDAR

### Conventions and Meetings

SAE Nat'l Tractor Mtg., Milwaukee,	Sept. 23-24
American Management Association, Manpower Stabilization Conference, New York,	Sept. 28-30
SAE Nat'l Aircraft Engineering & Production Mtg., Los Angeles,	Sept. 30-Oct. 2
National Safety Congress, Chicago,	Oct. 5-7
American Welding Society, Chicago,	Oct. 18-23
National Metal Congress, Chicago,	Oct. 18-23
SAE Fuels & Lubricants Mtg., Tulsa,	Nov. 4-5
SAE Annual Mtd. & Eng. Display, Detroit	Jan. 10-14

1. CUT FRICTION
2. CUT JOB DELAYS
3. CUT HIGH COSTS

*You Get These—*  
**TRIPLE BENEFITS**

with **IDEAL**

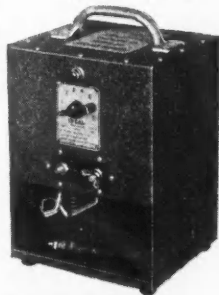
**"TRIPLE-DUTY"**

**LIVE CENTERS**

**Take Heavier Loads and Deeper Cuts at HIGHER SPEEDS**

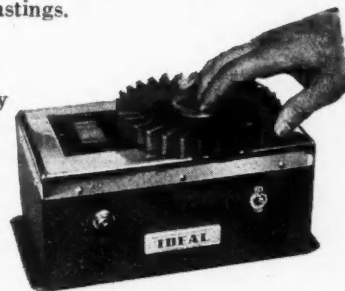
Only with IDEAL Live Centers can you have the many advantages of these three interchangeable inserts. They help you turn out MORE work, in LESS time, on lathes, millers, grinders, etc. Turn heavier loads,

take deeper cuts at higher speeds because IDEAL Live Centers rotate with the work. Use this precision-built Live Center which is accepted as standard in leading tool rooms and machine shops.



**IDEAL Metal Etcher** This new IDEAL All-Purpose Etcher permanently marks smooth-surfaced iron, steel and their alloys—tools, parts, dies. 14 Heats. Etches legibly, easily, permanently, regardless of the hardness of the metal. Convenient ground clamp for etching large heavy parts and castings.

**IDEAL Demagnetizer** Quickly demagnetizes work held in magnetic chucks, tools, drills, punches, dies, etc. A single pass across the magnetic poles and clinging metal dust, flakes, fine chips, etc., are gone. For small tools and large parts. Demagnetized tools cut faster, stay sharp longer.



**FREE . . . Machine Tool Accessory Catalogue** gives information on these and many other time-saving tools.

**IDEAL Sycamore**  
★ IDEAL COMMUTATOR DRESSER CO ★

3000 Park Ave.

Sycamore, Ill.

SALES OFFICES IN ALL PRINCIPAL CITIES.

## MEN . . . . .

**J. E. Harris**, formerly superintendent of the St. Paul Works, has been appointed superintendent of the Rossford (Ohio) Ordnance Depot which International Harvester Co. will operate for the War Dept. **Joseph Russell**, formerly general foreman of the Harvester McCormick Works parts warehouse, Chicago, will be assistant superintendent.

**Delos M. Palmer**, dean of engineering at the University of Toledo, has been named plant engineer of the American Propeller Corp.

**William D. Kennedy**, vice president in charge of sales and service, has been appointed manager of the Lockland, Ohio,

plant of Wright Aeronautical Corp. He succeeds **W. W. Finlay**, who becomes manager of industrial relations with offices in Paterson, N. J.

**D. B. Meadows**, formerly associated with Lincoln, Briggs and Fruehauf Trailer, has been named manager of the production and facilities dept. of the Detroit regional WPB office. **A. J. Stenger**, formerly head of the Stenger Bumper and Mfg. Co., has been appointed Detroit representative of the management-consultant division of WPB.

**C. Hart Miller**, vice president, has been appointed divisional manager of the Farmingdale Plant of Republic Aviation Corp. **Don M. Parker** will succeed him as director of the military contracts dept.

**J. M. Tucker**, formerly assistant to the general manager, has been named general sales manager of the Massey-Harris Co., succeeding **E. F. Schiell**, resigned. **C. E.**

**Krause**, secretary and director of purchases, and **Tucker** have been elected to the board of directors.

**Harry Patton**, district manager, has been advanced to national director of sales of Indian Motorcycle Co., succeeding **James A. Wright**, resigned.

**Curtis L. Moody**, formerly factory manager of the Dominion Rubber Co., Ltd., Canadian affiliate, has been named production manager of the tire division of U. S. Rubber Co., with headquarters in Detroit. He succeeds **R. Y. Copland**, who joins the central engineering dept. **James A. Daly**, formerly production manager, has been made factory manager of the Detroit plant, succeeding **George R. McNear**, who becomes Pacific Coast sales manager of the tire division, with headquarters in Los Angeles. **Thomas E. Clark**, formerly factory manager of the shell-loading plant operated for the government at Charlotte, N. C., has been appointed factory manager of the Fisk plant at Chicopee Falls, Mass., succeeding **C. E. Maynard**, resigned. **John M. Miller**, formerly factory manager of the munitions plant operated for the government at Marion, Ohio, has been named factory manager of the Los Angeles plant.

**Calvin K. Townsend**, formerly director of contract administration, has been named assistant general manager of Aircraft Accessories Corp.

**Russell E. Dill** has been appointed chief administrative manager of the Fleetways Division of Kaiser Cargo, Inc. **S. D. Hackley** has been named chief operations manager.

**Worthington Pump and Machinery Corp.** has announced the appointment of **L. E. Hammer** as assistant works manager of its Moore Steam Turbine Div. at Wells-ville, New York.

**F. B. DeLong** has been made vice president and general sales manager of Columbia Steel Co., San Francisco.

**T. Claude Ryan**, president of the Ryan Aeronautical Co., has been elected president of the Aircraft War Production Council, Inc., succeeding **LaMotte T. Cohn**, chairman of the board of Northrup Aircraft. **Courtlandt S. Gross**, president of Vega Aircraft Corp., was named vice president of the council.

**T. H. Wickenden** has been appointed manager of the Development and Research Div. of International Nickel Co. **H. J. French** is assistant manager.

**Gilbert G. Budwig** has resigned as president of Aircraft Components, Inc. to enter the Marine Corps. **Walter J. Innes, Jr.**, chairman of the board of Aircraft, succeeds Mr. Budwig as president.

**Quaker Chemical Products Corp.** has announced the appointment of **Robert W. Owen** as a metal process engineer covering Eastern Penna., Maryland and Delaware.

The appointment of **W. H. Richardson** as general manager of all activities of all divisions of The Timken Roller Bearing Co. on the entire West Coast and in the Orient, has been announced by the company. Mr. Richardson's headquarters will be in San Francisco.

**Joseph S. Sherer, Jr.** has been appointed vice president and assistant general manager of Reo Motors, Inc.

**Clayton S. Shoemaker** has been made eastern sales manager and **Frederick A. Koch** assistant eastern sales manager of Dow Chemical Co.'s New York office, with headquarters at Rockefeller Plaza.

**Robert T. Keller** has been made works manager of the Chrysler Tank Arsenal, replacing **M. J. Leonard** who is being detailed to another war job in the Corporation.

**Hercules Powder Company** has announced the appointment of **Dr. John H. Long** as head of the newly created Sales Research Division.

**I. T. O'Brien** has been promoted to special representative on the staff of **Her- man L. Weckler**, vice president and general manager of Chrysler Corporation, to assist in the executive management of the company.

This mechanical  
**BLIND RIVET**  
helps all three



**THE ENGINEER**, by using Cherry Rivets, can disregard blind spots in riveted structures. He designs up to efficiency, rather than down to a manufacturing limitation.



**THE PRODUCTION MAN** can increase output by using Cherry Rivets ... gets a better job in blind or hard-to-get-at places. One man does the job. No bucking bar is needed.



**THE SERVICE MAN** does a better job in less time. Does not have to ream holes because Cherry Rivets work well with reasonable tolerance in grip length and hole size.

CHERRY RIVETS, THEIR MANUFACTURE AND APPLICATION ARE COVERED BY U. S. PATENTS ISSUED AND PENDING.

**Cherry Rivet**  
Company  
LOS ANGELES, CALIFORNIA

Get the complete story on Cherry Blind Rivets in the Handbook A-43. Request yours from Department A-109, Cherry Rivet Company, Los Angeles 13, California.





# A Suggestion for POSTWAR PLANNERS



The quality of our postwar vehicles and machines will be much higher and their service life much longer than those before the war. Competition will force such improvements and many of them in fact are now in the design stage.

In designing postwar equipment you can always be sure of maximum service life and highest performance when "Perfect" Oil Seals are used. They retain lubricant and exclude foreign matter from the bearings. Their relative cost is small and they can readily be accommodated in the bearing design.

Write for specific data on the twelve models of "Perfect" Oil Seals.

## CHICAGO RAWHIDE MANUFACTURING CO.

1310 ELSTON AVENUE • CHICAGO, ILLINOIS

65 Years Manufacturing Quality Mechanical Leather Goods  
Exclusively and now Sirovons Synthetic Products

PHILADELPHIA • CLEVELAND • NEW YORK  
DETROIT • BOSTON • PITTSBURGH • CINCINNATI



## Kolene Metal Cleaning

(Continued from Page 40)

5. As the surface of the bearing has traces of alkalinity after the water rinse, an immersion in 25 per cent HCl for a period varying from 30 to 90 seconds acidifies the surface, desirable for the fluxing operation.
6. Immerse directly after acid (without rinsing) slowly into the molten Flo-Met'l through a sufficient head of zinc ammonium chloride top flux. As an alternative, a water solution of zinc ammonium chloride flux may be brushed on the bonding surface and the bearing immersed in Flo-Met'l. This helps prevent the coating where not desired.
- (a) As the bearing will float in Flo-Met'l, provisions should be made to hold the bearing completely under the surface of Flo-Met'l until all bubbling action has ceased.

- (b) The bearing may then, at the operator's option, be either forced under the flux container partition and withdrawn through a clean Flo-Met'l surface, or withdrawn through a clean Flo-Met'l surface and reimmersed through a clean Flo-Met'l surface to remove the residual flux from the surface of the bearing.
- (c) Before the bearing is withdrawn from the molten Flo-Met'l clean surface, any traces of oxides or flux on the surface of the Flo-Met'l pot should be skimmed back with a wooden skimmer or paddle.

The Kolene process has been widely investigated by many official agencies as well as by bearing producers and engine builders. It merits the attention of automotive producers confronted with similar problems of bearing bond-

ing, brazing, soldering, etc. One other application of automotive importance is the practicability of re-working worn bearings or connecting rod assemblies. With the Kolene process it is perfectly feasible to dissolve the worn bearing material and then to re-babbit without machining, simply by preparing the old surface by the Kolene process and "tinning" with Flo-Met'l.

## New Materials Influence Designs of the Future

The following is condensed from an article by T. F. Saffady, head of Sav-Way Industries, Detroit, which appeared in the September issue of *Sav-Way Research*, the first issue of a new house organ. Mr. Saffady was the winner of the Academy Award which was presented to him last June by the American Society of Industrial Engineers.

The metal-working industry, said Mr. Saffady, must face the fact that the transition from war to peacetime production will involve not only new products but new materials and processes—which may have been unknown before Pearl Harbor. From present indications it's a safe guess that these materials will fall into three general classes—the lighter metals such as aluminum and magnesium, laminated woods and plastics.

All three of these classifications are marked by one common characteristic—the abundance and relatively low cost of the basic raw materials from which they are produced. They have another set of characteristics in common: light weight, great strength, and flexibility in production. Plastics, in addition, possess an adaptability of use and decorative possibilities which, for many applications, raise them above competition.

The published designs of tomorrow's cars and airplanes, building equipment and home appliances indicate that beauty has been given an important place in the designers' considerations. This is undoubtedly true, but it is also true that these designs represent a more thorough consideration of utility and adaptability to production methods and materials than has ever been true in any previous production era.

The metal-working manufacturer of today has two opportunities open to him for the future—the production of products from these new materials, or the production of equipment by which these materials may be processed. In either case, he must realize that in two or three years of war production, industrial research has equalled the progress of ten or twenty years of normal peacetime advancement. If his firm is to be ready to take its place in the new peacetime production world, he must prepare now for the change that may be closer than we know. He owes it to his company and to his employees to insure that his plant will take its place in the world of the future.



## Specify JOHNSON BRONZE

- When you tackle the problem of new designs or new equipment . . . start with the bearings. No other item in a motive unit carries the same high degree of responsibility. When you want smooth, quiet performance . . . long, trouble-free operation . . . Specify JOHNSON BRONZE Sleeve Bearings.

The first step is to call in a Johnson Engineer. Permit him to study your applications . . . to make recommendations based entirely on facts . . . free from all prejudice . . . backed by more than thirty years experience. His knowledge covers the manufacturing of all types . . . cast bronze, sheet metal, babbitt-lined and powdered bronze. His services are offered without obligation. Write today.

### For the ENGINEER

Practical data on SLEEVE TYPE Bearings covering such topics as Design, Alloys, Lubrication, etc. Write for the complete set.

**JOHNSON BRONZE**  
SLEEVE BEARING HEADQUARTERS  
625 S. MILL STREET NEW CASTLE, PA.



*Buses.. Tractors.. Automobiles.. Airplanes*

# of Tomorrow may be "on the board"

.. But its **BRAKES**  
are in Production Now!

With the Lambert Disc Brake all the desirable features of the present type conventional brake are retained while all of its objectionable features are eliminated.

The Lambert Disc Brake is a brake for Trucks—Buses—Tractors—Passenger Cars and Planes with a definitely higher safety factor . . . a brake requiring less attention and repair . . . a brake with lower service costs.

The Lambert Disc principle insures uniformly distributed braking pressure which keeps the brakes in safe and correct adjustment longer. It provides the same fast, smooth, efficient speed control of backward motion as of forward motion . . . and with much less pedal effort.



## Lambert

DISC BRAKES



Auto Specialties Mfg. Co., St. Joseph, Mich.

## Cadillac Building Tank Engines

(Continued from page 50)

new pistons and rings. The high altitude engine required 476 additional machine tools. Packard engineers redesigned the gear drive in the British two-stage, two-speed supercharger, applying the overdrive principle. The British version uses two trains of gears. The rotor vane for the supercharger is an aluminum forging balanced to 1/100th of an ounce-inch. It revolves at 25,000 rpm. The precision

qualities of this engine require the use of 85,000 gages, and 175 gage inspectors are required to check them constantly for accuracy. Seventy-one different types of metals and alloys are used in the Rolls-Royce engine.

Packard's production of aircraft and marine engines for the first six months of 1943 was up 124 per cent over the first half of 1942. E. W. Hives, managing director of Rolls-Royce, Ltd., of England, was a recent visitor at the Packard plant, helping to work out plans for translating engineering changes into production line changes in a matter of a few weeks instead of

seven months, as at present. Hives praised the job Packard is doing and said he would not be making the visit except for Packard's success. He said Packard would be asked to do more and more in supplying the powerplants that go into the British Hurricanes, Lancasters and Mosquito bombers. He said the Rolls-Royce engine delivers more hp per cu. in. of engine displacement than any other aircraft engine in service.

War production in July registered a 3 per cent gain over June, according to the monthly report of Donald M. Nelson, chairman of WPB. This compared to a 2 per cent advance in June and no gain in May. The munitions production index in July reached 593, nearly six times the pre-Pearl Harbor rate of 100. Aircraft output of 7,373 planes marked a 4 per cent increase over June, but still was 12 per cent behind schedule. Fighter production gained 19 per cent, heavy bombers 13 per cent and transports 8 per cent. Design changes and labor shortages were among the factors attributed for the failure of aircraft production to rise faster. Aircraft ordnance output increased faster than aircraft. July production of field signal equipment advanced 17 per cent and ground ordnance 6 per cent while Army ammunition held the June level. Output of combat vehicles was up 9 per cent over June, while motor vehicles gained 6 per cent; artillery, anti-aircraft guns and small arms, 5 per cent. July machine tool shipments totaled \$97,488,000, a 10 per cent drop from June, while the backlog declined to \$411,311,000; 4.6 months production at the July rate. Near completion of the munitions plant tooling program is the chief factor in the reduced output, according to WPB.

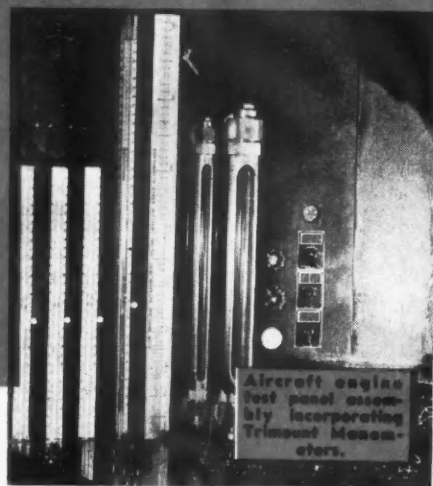
July deliveries of war materials by the automotive industry totaled \$775,000,000, according to the ACWP. This marked a 4 per cent gain over the revised June total of \$747,670,000 and an 81 per cent increase over July, 1942, when shipments were \$457,150,000. Shipments by the industry now are at an annual rate of \$9,300,000,000.

Bendix Aviation Corp. is one of the largest suppliers of aircraft parts and accessories for the huge airplane program. July output of injection type carburetors in four plants at South Bend, Ind., Chicago, Owosso and Wayne, Mich., exceeded the total manufactured in the entire year 1940. The Chicago plant, comprising four units, got into production late in June but at peak it is expected to be the largest airplane carburetor plant in the world. Similar progress has been made in increasing airplane starter output. May production of enough airplane engine starters to equip 10,000 military planes at the Eclipse-Pioneer Division of Bendix, Teterboro, N. J., was equal to 40 per cent of all the starters delivered in 1941 and 150 per cent of 1940 deliveries. Starter output for the first five months of 1943 was double the same period of 1942.

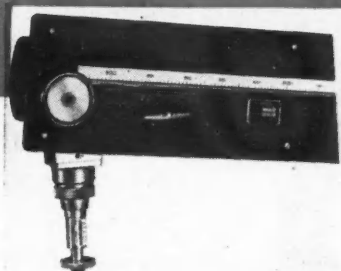
## Typical TRIMOUNT MANOMETERS

FOR

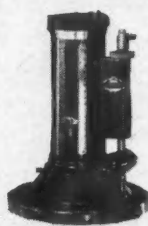
*Aircraft  
Testing...*



Aircraft engine test panel assembly incorporating Trimount Manometers.



Closeup of Trimount inclinometer showing compensator for barometric pressure and temperature. Scale Selector on front of panel.



Micro-Manometer. A master instrument for calibrating manometers. Range 0 to 150 mm. Reads to 1/100 mm. A jewel of precision! Manufacture licensed under Ashuaia patents.

**S**PECIALIZING in accurate, dependable manometers for all pressure and vacuum measurements, Trimount offers a complete line of instruments from simple U-tube service units to elaborate precision portable panel assemblies.

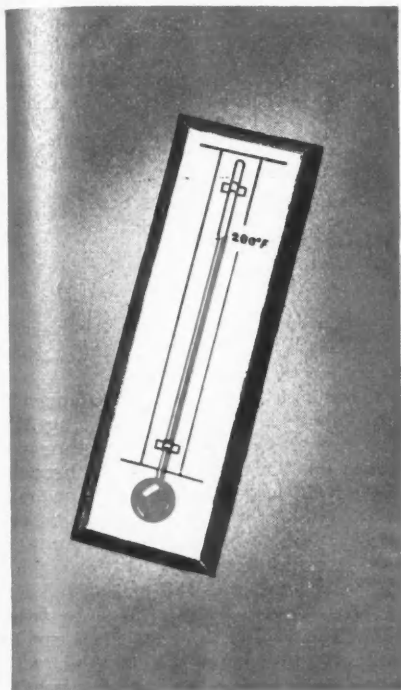
Write today for literature and recommendations on Trimount Manometers to meet your needs.

**TRIMOUNT INSTRUMENT CO.**  
625 Old Colony Bldg., Chicago 5, Illinois

READ BOTH PLUS AND MINUS PRESSURES ON THE SAME INSTRUMENT! Absolute Pressure Gauges, originated by Trimount, permit direct readings of both plus and minus pressures. And now, new foolproof construction permits direct shipment to you, ready for installation! Write for specifications and prices.

**TRIMOUNT**  
*Red Line*  
**MANOMETERS**



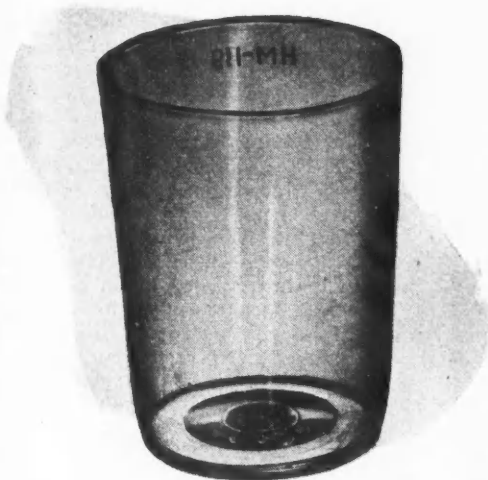


**BELOW**—unretouched photographs of drinking tumblers molded from General Purpose "Lucite" and from heat-resistant "Lucite" molding powders. Here is visual evidence of the marked superiority in heat-resistance of the new "Lucite" over General Purpose "Lucite" or other acrylic powders. (These tumblers do not represent a current wartime application of heat-resistant "Lucite," but are used for illustrative purposes only.)

**1. Right**—Tumbler molded from GENERAL PURPOSE "LUCITE" boiled in water (212°F) 8 minutes. Note pronounced heat distortion and clouding.



**2. Below, left**—Tumbler molded from heat-resistant "Lucite" boiled in water (212°F) for 8 minutes. Shows only slight loss of shape and transparency.



**APPLICATIONS.** Heat-resistant "Lucite" offers many possibilities for new and improved design. Here are some typical product-uses for heat-resisting "Lucite": Flying Light Lenses . . . Reflectors for Military Vehicles . . . Cases for Lamps and Batteries . . . Dial and Meter Faces . . . Automobile Blackout Lenses . . . Insulation for Radio Equipment . . . Medical and Dental Instruments . . . Automobile Instrument Lenses . . . Airport Signal Light Lenses . . . Electrical Switchboard Color Caps . . . Railroad Signal Light Lenses . . . Transparent Coverings for Industrial Lights . . . Bathroom Fixtures for Barracks and Battleships . . . and scores of other applications.

HEAT-RESISTANT "Lucite" is another example of how Du Pont technicians are helping the molding industry to produce better molded pieces more quickly, at less cost . . . and how they are helping to supply engineers, designers and actual users with improved materials to meet their broadening requirements.

**BACK THE ATTACK WITH WAR BONDS**



**FREE BOOKLET ON HEAT-RESISTANT "LUCITE"**

Contains valuable information for molders, designers, engineers and production men. Compare the properties of heat-resistant "Lucite" with those of General Purpose "Lucite." For your free copy, or for information on the application of heat-resistant "Lucite" to your product, write on your business letterhead to: E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Arlington, N. J., or 5801 So. Broadway, Los Angeles 3, Calif.



**"LUCITE"**

**methyl methacrylate resin**

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

## BOOKS . . . .

Ninety-eight outstanding papers on arc welding, submitted by trained technicians and engineers in The James F. Lincoln Arc Welding Foundation's 1940-42 Industrial Progress Award Program, have been edited and published in what is said to be the most comprehensive and complete collection of design studies on arc welding published since the Foundation's first volume was issued in 1939.

The volume is the result of the careful editing of papers on arc welding practice representing the work of 113 engineers, designers, works managers, superintendents, executives, foremen and other tech-

nicians, each of whom applied himself individually to a specific design study involving arc welding.

"STUDIES IN ARC WELDING" will provide engineering, technical and trade schools with a tremendous amount of authentic arc welding design applications, together with welding data which may be translated into new applications.

The contents of the book are arranged in nine sections with 98 chapters. Each chapter covers a specific design subject; each section covers a particular field, such as aircraft, railroad, etc. There are 1007 illustrations, the majority of which are actual photographs of welding procedures. Each study includes designs, calculations, procedures and other pertinent information which show how the advantages attributed to arc welding are obtained. Many of the studies involve plants now engaged

in war production, but the principles and practices reported in individual studies are also applicable to industrial design and manufacture in the post-war era ahead.

"STUDIES IN ARC WELDING" is priced at \$1.50 per copy, postpaid anywhere in the United States, \$2.00 elsewhere. Copies may be secured by writing The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio.

## Much Tighter Labor Controls

(Continued from page 48)

men, such as engineers, toolmakers, trained inspection experts and certain administrative personnel.

In order to help correct an unusually acute labor shortage at the Boeing Aircraft Co. in Seattle, the WLB approved revised job classifications which brought substantial wage increases. Top rate for the highest class of machinists was set at \$1.60 per hour, amounting to a \$1.00 per day increase. WLB justified this "rare and unusual" action by saying the avowed purpose was to boost production of Flying Fortresses and to eliminate the wage differential with nearby shipyards. An earlier proposal at Boeing to change to two 10-hour shifts daily, which would increase total man-hours by 20 per cent, was rejected by the Aeronautical Mechanics Union (AFL). Boeing employees apparently are still dissatisfied with the WLB decision of last March which granted them only a 4½-cent per hour wage increase, while Southern California employees received 7½ cents. The union blamed the failure of the WLB to grant a "living wage" as the reason for Boeing's manpower shortages and resultant production lags. Diversion of excess workers from shipyards may help alleviate the Boeing shortage.

The question whether plant guards are under military or union discipline was raised recently when four guards at the Johnsville, Pa., plant of Brewster Aeronautical Corp. were placed under military arrest and called before a Navy court martial for failing to take their posts. Four thousand employees at the plant staged a three-day strike in protest until they finally returned to their jobs at the insistence of the WLB and R. J. Thomas, president of the UAW-CIO. The guards, members of the U. S. Coast Guard temporary reserve as well as of the UWA-CIO, refused to take their posts, thus violating their military oaths. The guards wanted posts assigned on the basis of seniority rather than by military orders. Twenty-eight other guards also were arrested but released as "prisoners at large" pending the outcome of the court martial. The union filed a 30-day strike vote notice under the War Labor Disputes Act as a result of the trouble.

In an unprecedented bargaining action, General Motors Corp. submitted 16 demands upon the UAW-CIO as negotiations for amending the company-union contract, which is open for revision after Oct. 5, got under way in

# Save AIR, TIME, EFFORT!

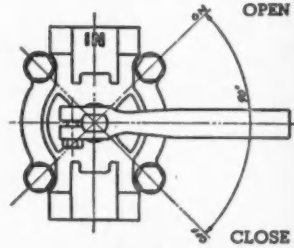


*Finger-Touch*

with  
**NOPAK**  
Quick-Opening  
SHUT-OFF VALVES

## QUARTER-TURN LEVER CONTROL

A quarter-turn of the valve lever positively opens or closes the valve, permits quick or throttling action. Position of lever shows degree of opening.



A flick of the finger opens or closes the NOPAK Shut-Off Valve. There's no slow, laborious wheel-turning . . . no pressure lost while valve is manipulated . . . no working time lost!

On lines connected to air guns, chipping hammers, drills and other air powered tools, these quick-acting valves prevent air waste, conserve valuable man hours for production effort.

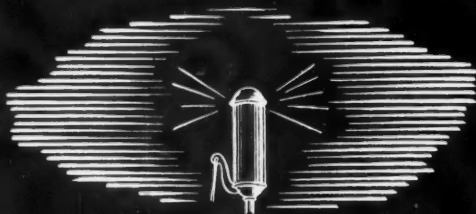
The patented NOPAK Rotating Disc principle makes these shut-off valves leakproof and wear-proof. Their flat, lapped-disc sealing surfaces improve with use. There are no tapered plugs or interlocking contours to stick or wear out . . . no packing to replace. Pressure sealed disc and seat are always protected from grit abrasion. May also be used for Oil, Water or Gas.

Write for Illustrated Folder

**GALLAND-HENNING MFG. CO.**  
2767 S. 31st Street Milwaukee, Wis.

Representatives in Principal Mining Centers

**NOPAK** VALVES and CYLINDERS  
DESIGNED for AIR or HYDRAULIC SERVICE



## Dare We Speak of Peace?

Yes—because it means so much to all of us individually. With it will come again those products of industry like the car, the radio and the refrigerator, which never were luxuries so much as necessities. And those who are thinking in post-war terms are asked to remember that Weatherhead will be prepared to help build these products again as well as the many strange new ones destined to emerge from this war.

*Look Ahead with*



# Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

*Manufacturers of vital parts for the automotive, aviation,  
refrigeration and other key industries.*

Plants: Cleveland, Columbia City, Ind., Los Angeles  
Canada—St. Thomas, Ontario



Detroit. The corporation's entire supervisory personnel was consulted, according to Vice President Harry Anderson, for recommendations which would increase war production, improve efficiency, conserve manpower, improve discipline and eliminate abuses of privileges granted to union committeemen. Among GM demands were elimination of the maintenance of membership clause, which was imposed by the WLB last year; withdrawal of union opposition to individual piecework or incentive methods of pay, automatic discharge of an employee who participates in an unauthorized work stoppage and

consideration of merit and ability before seniority in transfer and promotion of employees.

GM asked seven changes in the grievance procedure designed to reduce by 50 per cent the time available to union committeemen and prevent abuse of their privileges. On the subject of incentive pay, the corporation said it was satisfied that it would increase war production from 10 to 25 per cent without increase of manpower. In contradiction to the general spirit of bargaining procedure, Walter P. Reuther, head of the GM Dept. of the UAW-CIO, summarily rejected all 16 demands in a

public announcement. Reuther termed the company demands as "political propaganda against the GM workers, intended to throw a smoke screen around the union's constructive proposals." On the subject of incentive pay, to which Reuther is vigorously opposed, he said, "Piecework will not increase production. It will cause dislocation of schedules, lead to layoffs and unemployment and will pit worker against worker in a speedup contest which will lead to chaos, rate cutting and destruction of labor morale." The UAW-CIO already had drawn up its demands upon GM early in August.

Formation of an Automotive Section by the National WLB to handle on a national basis labor disputes and voluntary wage adjustments of automobile and body companies having central offices in the Eleventh (Detroit) Region has been completed. David A. Wolff, Detroit attorney who is vice chairman of the Detroit regional board, is chairman and public representative of the Automotive Section. Industry members are John L. Lovett, general manager of the Michigan manufacturers Ass'n; Frank Rising, general manager of APFM; and W. J. Cronin, of the ACWP. Labor members are Morris Field, Washington representative, and D. M. Gallagher, organizer, both of the UAW-CIO. All these men are regular members of the Detroit regional WLB. AFL members will be substituted in cases affecting that union.

Appearance before the Automotive Section is voluntary on the part of the company and the union. Some hearing will be held before a board examiner, who then will submit the evidence to a tripartite panel chosen from the members of the section and composed of one labor, industry and public representative. Recommendations of the panel are then subject to approval or revision by the full regional board. The section presents the advantage of having persons intimately acquainted with the automotive industry pass upon its problems. In rate cases the section will consider area rates and company policies so that area rates will not become unstabilized. The centralization will enable parent automotive companies and international unions to handle through their home offices problems affecting their organizations nationally. First dispute referred to the section was one involving Chrysler Corp.

Another Chrysler dispute, that involving wage rates and vacation pay, has been referred to the National WLB after six weeks of negotiations failed to reach any decision.

#### Increased Commitments

American Aviation Corp., Jamestown, N. Y., has been granted an increase of \$1,150,000 in its contract with the Defense Plant Corp. for facilities, making the total commitment \$1,240,000. Ex-Cell-O Corp., Detroit, has received a \$220,000 increase for additional equipment for a Detroit plant.

*Announcing*

THE CHANGE OF OUR NAME

*to*

**DETREX  
CORPORATION**

Over a period of many years the trade name "Detrex" has identified the products of this company. We feel that its adoption as our corporation name is singularly appropriate.

This change of name in no way affects the personnel, ownership, or policies of this organization.

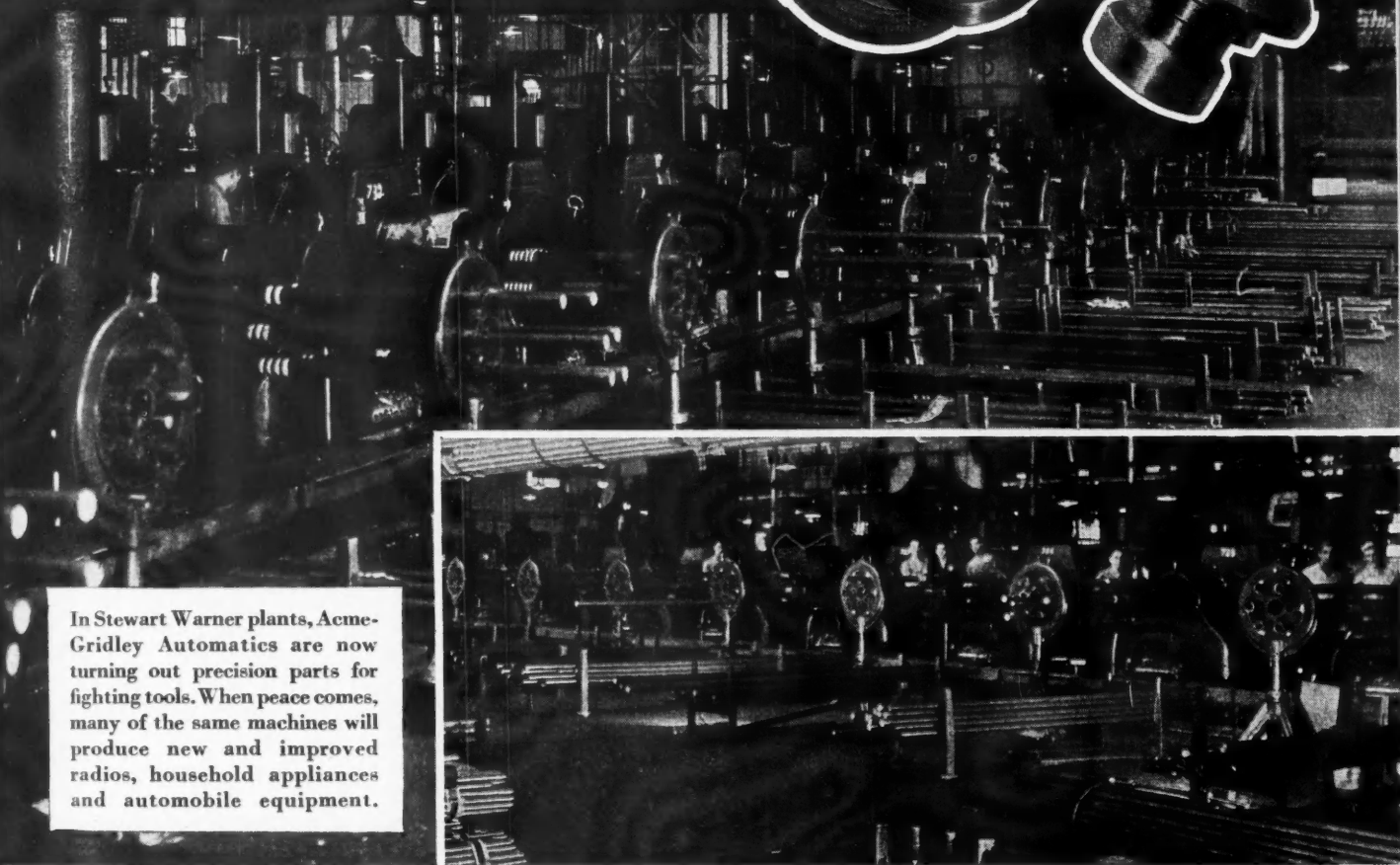
**DETROIT REX PRODUCTS COMPANY**

DETROIT 27, MICHIGAN



Detrex manufactures: Degreasers using stabilized safety solvents, Perm-A-Clor and Triad...Washers for Alkali, Spirits and Emulsion Cleaning...Rust Proofing and Processing Machines...Triad Cleaning Compounds, Strippers, Emulsions, and Wet Spray Booth Materials...Dry Cleaning Machines and Solvent Recovery Units...Oil Extraction Plants.

# IN AMERICA'S GREAT PRODUCTION PLANTS..



In Stewart Warner plants, Acme-Gridley Automatics are now turning out precision parts for fighting tools. When peace comes, many of the same machines will produce new and improved radios, household appliances and automobile equipment.

## PRECISION . . . IN "TENTHS" PRODUCTION . . . IN MILLIONS

There is the reason why America's war production is giving our men the best of fighting equipment—and doing it *fast*.

Acme-Gridley automatics are today turning out millions of parts for guns, planes, tanks and ammunition — with dimensions measured in tenths of thousandths — each

part accurate and interchangeable.

Production goes on at the highest speeds and fastest feeds modern tools will withstand.

Acme-Gridley automatics will be ready to deliver that same kind of fast, accurate production for peace—at lower costs than we have ever before known.

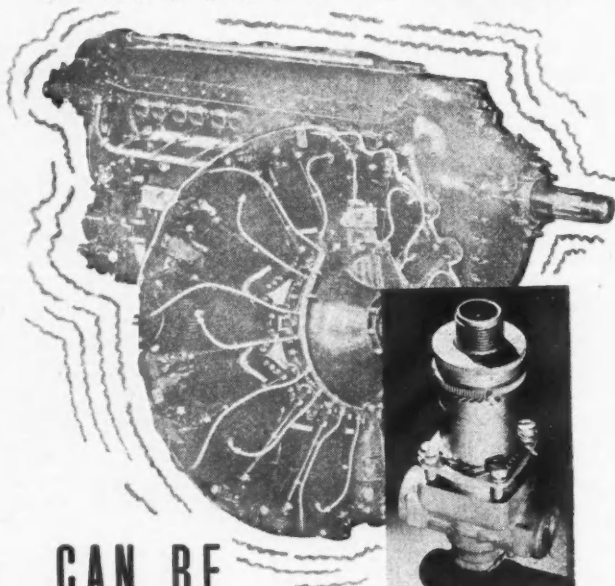
# THE NATIONAL ACME CO.

170 EAST 131<sup>ST</sup> STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING



# LIGHT WEIGHT VIBRATION RESISTANT **hi-g** ELECTRIC VALVES



## CAN BE MOUNTED ON ENGINES

Because they are vibration-resistant, General Controls **hi-g** Valves can be installed where they are best suited from a utility standpoint. General Controls electromagnetic valves operate in any position, regardless of vibration, acceleration or change of motion. Because they are vibration-resistant, they can be engine-mounted, simplifying plumbing, saving materials, saving space, saving weight, saving time, saving money.

Fast acting and light in weight (the Type AV-1 Valve illustrated above weighs but 8½ ounces!) these valves are designed for various automatic and remote control requirements. They are available in more than a score of types, handling aromatic or domestic gasolines or vapors, air, hydraulic oil, anti-icing fluids and lubricating oils, and pressures up to 3000 lbs. or more. Write or wire today for engineering data and Descriptive Bulletin.

\*TRADE MARK—**hi-g** indicates positive ability to operate in any position, regardless of vibration, change of motion or acceleration.

## GENERAL CONTROLS

Wartime Manufacturers of Electro-Magnetic and Temperature Controls for Aircraft • Peacetime Producers of Automatic Pressure, Temperature, and Flow Controls

801 ALLEN AVENUE, GLENDALE 1, CALIFORNIA  
BOSTON • NEW YORK • PHILADELPHIA • DETROIT  
CHICAGO • CLEVELAND • DALLAS • DENVER • SAN FRANCISCO

## Chemical Surface Treatment for Steel

(Continued from page 20)

phosphate coatings must withstand three hours, and oiled coatings 24 hours. Dry oxide type finishes must withstand ½ hour, and oiled coatings, two hours. Ordinarily cadmium-plated parts are required to withstand 250 hours.

It can readily be seen that this new specification will not give a true picture of the corrosion resistance of the various coatings, as there are on the market today rust preventive oils which will withstand 500 to 1500 hours in the salt spray on bare steels. According to test results from at least one major aircraft company, properly applied and passivated dry phosphate coatings will withstand approximately 100 hours in the salt spray against two to six for dry oxide type coatings.

A Los Angeles paint company, working in conjunction with a process engineer from one of the aircraft companies, has recently developed a drying type oil finish to be applied over phosphate coatings. It is readily absorbed into the pores of the coating and gives an abrasion resistant finish. Regular primer and lacquer coatings may then be applied over this finish. Without additional paint coatings test panels have withstood nearly 1000 hours in the salt spray. If coats of primer and lacquer are added, over 2000 hours could be expected.

One serious drawback of cadmium plated parts is the fact that threads give galling and flaking troubles. Government aircraft specifications do not allow undercutting of threads to be plated. This difficulty is overcome in the use of phosphate coatings, which do not flake or gall. Phosphate coatings will usually average around .0002-.0005 in. per side, depending upon the type of cleaning used. Tests show that vapor degreasing and alkaline cleaning give two different thickness of deposit. Due to their non-metallic nature, these coatings are fairly poor conductors of electricity. Accordingly, spot welding would not be practical and special precautions should be taken when electrical bonding (i. e. grounding) of parts is desired.

### Applications of Oxide and Phosphate Coatings

Prior to the war the oxide type coating was used for blackening steel by many different industries. At present oxide coatings are being used mostly by several manufacturers of small arms for the Army. The aircraft industry uses them slightly due to their low salt spray resistance.

The use of phosphate coated steel has increased several fold in the past two years. Prior to the war some of the automobile manufacturers were using these coatings on auto bodies prior to painting. Hugh conveyorized installations capable of spray-coating completed bodies were in use.

Now with a shortage of stainless steel and cadmium plate, several steel companies are furnishing low-alloy steel sheet covered with a very thin zinc plate which has been phosphate coated for greater corrosion resistance. A little over a year ago, the aircraft companies were asked to conserve stainless steel and aluminum wherever possible by substituting low-alloy steel. In many cases these steel parts are being phosphate coated and painted. Examples include firewalls, skin sections, gussets, inspection doors, cable terminals, small fittings, clips, fasteners, speed nuts, equipment, and accessories.

Phosphate coatings would not be practical for such aircraft parts as landing gear assemblies as they do not have good abrasion resistance. However, as there are so few parts on an airplane which require exceptional abrasion resistance, it can be seen that many substitutes can be effected. After the war these chemical coatings should find increased favor for civilian articles due to the experience gained at present.



## Mass Production of Airacobras

(Continued from page 26)

process. In addition to the parts mentioned above, the empennage assembly, propeller, Allison engine installation, and other elements, are installed at the proper stage of assembly by means of the sensitively controlled hoists, doing the job quickly, safely, and without manual exertion on the part of the operators, many of whom are women.

Digressing for a moment to the mezzanine, consider the tubing fabrication department. Here they handle all manner of tubing harness in the great variety of sizes, lengths, and forms. Tubing is annealed in a Lindberg furnace, bent to form on various hand-bending and mechanical bending machines. One interesting detail is the swaging of tube ends to a smaller diameter but with uniform wall thickness in a machine using special dies developed here. Fabricated tube assemblies are cut to desired form on a battery of Tannewitz saws.

Another mezzanine department is devoted to the formation of various plexiglas sections. Plexiglas sheets are heated in Lindberg furnaces, then bent to form on specially-designed work holding fixtures, machined and buffed.

Still other departments handle wiring harness and electrical assemblies of various kinds, in preparation for the final assembly lines.

The second plant is in reality a huge fabrication establishment, handling press shop operations, welding, heat treating, a large machine shop and gear cutting department. In addition, this plant produces wings on a fully mechanized assembly line. We now look upon some outstanding techniques developed recently and placed in operation about the time this article was prepared.

First of these is an impressive chromodizing and paint dip conveyorized unit developed by plant engineers, constructed by Hanson-VanWinkle-Munning, which has greatly increased productivity with a sharply reduced drain on man-power. The unit comprises a series of seven tanks, provided with a blower system for drawing off fumes from the alkaline cleaner, chromic acid tank, and steam from the hot water rinses. Cycle of dips includes: an alkaline cleaner solution, clear-water rinse, chromic acid solution, clear-water rinse, pure-water rinse, drier station, and finally paint dip. The conveyor tracks loop out of one tank and into the next. The conveyor tracks loop from the starting station into the alkaline tank, carry straight across from the first station of the alkaline tank to the second station of the same tank.

Conveyor tracks loop into and out of each of the four remaining tanks of cleaning and chromic acid liquids. After leaving the final water rinse the tracks carry evenly across driers and then

loop into the paint dip. Coming out of the paint dip the conveyor is routed directly up to a position above the incoming tracks. Carrying across the elevated return route, the tracks finally carry the parts to a position close by the loading station. There the screen containing the painted material automatically drops its load onto a waiting dolly and the track continues on to the loading station where another cycle is started.

Chromic acid is kept at 140 degrees while in the tanks. The conveyor is timed to process the metal for two minutes in each of the tanks. The metal is processed for six minutes in the alkaline dip, due to the fact that the conveyor has two stations in the enlarged alkaline tank.

A total of 78 minutes is consumed in completing the cycle. Racks carry anywhere from 150 pieces to 350 pieces. Dollies are loaded by a force of six girls at a position apart from the conveyor. They are then rolled to the starting position of the conveyor, screens of the dolly are automatically attached and carried away through the

# BUELL AIR COMPRESSOR



**B**UELL Air Compressors are used on bomber and fighter planes to operate brakes and machine guns. Here, where reliability is of first importance, the workman-ship and precision manufacture pay real dividends in dependable operation. 12 years of operation on cars, trucks, buses, boats and railway trains was the proving ground for their adoption as an aviation accessory.

**B**UELL Air Compressors can be operated at speeds of 2000 to 3400 R.P.M. Pressures in excess of 225 pounds are built. Safety control of air pressure is automatically handled by Buell design and retention of air is assured thru precision valve construction. Self contained oiling, bronze connecting rod and bearings. Moving parts are held to a tolerance of .0002".

**ACTUAL  
SIZE**

**WEIGHT  
5 LBS.**

**DISPLACE-  
MENT**

**1.2 CU. FT.  
AT 3500  
R.P.M.**

**AVAILABLE**

**ON PRIORITY**

**BUELL MANUFACTURING CO.**  
Dept. AA, 2975 COTTAGE GROVE AVE., CHICAGO, ILL.

chromodizing and painting and are untouched until they are returned ready for assembly. The screens are automatically lowered off the conveyor on dollies. The dollies then are rolled out of the conveyor cycle and unloaded at a station separated from the conveyor.

The mixture of paint used is three parts toluene and one part zinc chromite primer. A viscosity test is made at two minus to two plus from 16, and the tests are made four times in a 24-hour period. Vapor-proof agitators are installed in each corner of the paint tank, serving to keep the paint from settling. When the conveyor carries a screen of parts into the paint dip, the agitators are shut off.

The chromodizing unit is protected against fire hazard by a cardox refrigerated CO<sub>2</sub> system mounted on a platform at the rear of the installation.

Another important technical process is a chemical cleaning unit built by Bullard-Dunn to specifications furnished by W. A. Hammond of Bell. In appearance, at least, it is similar to other Bullard-Dunn installations in the automotive industry. Its function is to provide chemically clean metal surfaces in preparation for spot welding. Since the introduction of the process, 400 to 600 welds can be completed before dressing the welding tips as contrasted with the former practice of tip dressing after 45 to 50 welds.

The conveyor has six stations with screens carrying aluminum alloy parts. It revolves over five tanks erected on the floor of the plant, each tank containing 1000 gallons of fluid. Between the fifth and first tanks is an open space used as the loading and unloading station. Work at each station is processed in proper sequence in the five tanks. When a screen of parts reaches the unloading station, its contents are ready for the spot welding machines without further cleaning.

Parts made of S.T. are processed in each of the five tanks for a five minute period, the machine being set for that time cycle. Parts made of S. O. require only 1½ minute immersion in each tank. The first tank is a Detrex vapor degreaser, the second tank contains Diversey aluminum cleaner kept boiling by an automatic heating system, the third contains a hot water rinse, the fourth tank a dioxide cleaner, while the fifth tank furnishes a second water rinse.

Below the large tanks is a sewer capable of drawing off the contents of the five tanks in a matter of minutes. Provision of the cleaning fluid and conveyor system to replace the former hand cleaning operations, has enabled the department to increase its cleaning capacity about 300 per cent.

Bell boasts one of the largest hydraulic presses in use in the aircraft industry—a 5000-ton Lake Erie unit. For maximum production this press, each shift, requires the services of 26 girls, in addition to four men who change tools and dies. It has four electrically controlled boards, two at each end of the machine. These are on tables mounted on tracks and are alternately rolled into position so that one board is moving to the press bed while workers prepare and remove parts from the other three. Six persons work at each table with two operators at the master controls. The press head cannot be lowered until the operators at the master controls and the table control press buttons simultaneously on opposite sides of the press.

In addition to this large press, Bell has a 2000-ton press, a 750-ton press and a smaller unit, all manufactured by Lake Erie. These presses utilize the Guerin process, with forming blocks arranged on the boards, pressure plates over the sheet metal, and the heavy rubber pad on the punch.

Heat treating is one of the major operations in the fabricating plant. Houghton's Perliton Liquid Carburizer is used in salt bath furnaces for carburizing mild carbon temporary dies for blanking and forming operations in the press shop.

Armor plate is heat treated in an elevated furnace of air-circulating type and dropped through a trap door in its floor directly into a quenching bath below. Houghton's soluble quenching oil is used for this purpose as well as in quenching certain types of aluminum and aluminum alloy parts.

Type SO aluminum parts are heat

## BRAKE DRUMS to *meet your specifications*



**WE** build brake drums to meet a specific need, because with us brake drums are a major item—necessary to the war effort—and not a side line. *We are brake drum specialists.*

Brillion Brake Drums are cast high tensile strength gray iron, the finest that foundry skill and experience can manufacture. Thousands of Brillion Brake Drums are in use today on trucks and fighting equipment—all made to meet the manufacturer's specifications. Send us your specifications for quotations.

BRILLION IRON WORKS, INC.

BRILLION, WISCONSIN

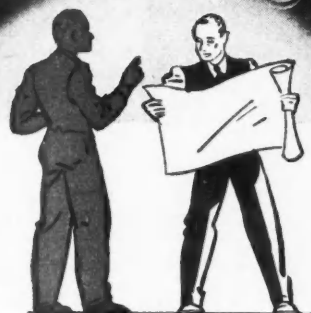


**Brillion**  
BRAKE DRUMS





*then I said  
to myself—*



## Here's How to Reach That Post-war Market Quick

*So you want to get the jump on competition—get to that post-war market first with the most sales features? Then take a tip from the Army's amphibious truck—the "duck".*

Well, it is a versatile vehicle—carries troops or cargo across water or land—doesn't even stop in going from one to the other. Say, if only I could do likewise—drive straight ahead without a stop and with all our people aboard—in going from war products to peacetime products.

*Then, hop aboard the vehicle used by builders of the "duck", the Liberty ships, the M-4*

*tanks, the bombers and fighters, and hundreds of other war products. They went from peacetime products to war equipment almost overnight. Their vehicle is WELDING.*

Sounds logical. Welding does simplify design . . . quickens tooling up . . . speeds production . . . makes selling easier because it makes products better and cheaper.

*And one more suggestion. Learn how to drive this V-day vehicle fast and straight with Lincoln's aid on welded design and procedure. Start NOW.*



**THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO**



treated in a battery of three, box type Lindberg furnaces after forming. Interesting feature of the installation is the quenching tank which serves the three furnaces. The tank rolls on rails and is quickly moved from one tank to another. The parts are heated in the air-heated furnace for one hour, then discharged into the empty quench tank and given a water spray quench.

Welding is another highly developed art at Bell. They use resistance welders for spot welding, oxy-acetylene torch welding for small fabricated assemblies; and a battery of Hobart portable electric arc welders for the welding of stainless steel parts. Resistance welders are of the most advanced types

known to the art—a large battery of the familiar Sciaky welders, several Taylor-Winfield Hi-Wave machines, and a Federal welder—all with elec-

tronically controlled timing cycle. For the most part these machines are fitted with water cooled holders and welding tips supplied by P. R. Mallory.

## Half-Trac Assembly Operations

(Continued from page 38)

gram, White has added much new equipment particularly by way of spray booths and baking furnaces. On the chassis line will be found an imposing line-up of the familiar Mahon water-back spray booths and huge Fostoria infra-red lamp baking ovens which are responsible for an improvement in

quality and for a major saving in man-hours required to paint and dry the chassis. Painting and baking operations now are so rapid that they are integrated with the speed of the assembly line conveyor. On the military vehicles the dash and instrument panel assembly is a large and intricate unit. Consequently, we find that it has been dignified by specialized treatment on a sub-assembly conveyor line adjacent to the chassis assembly department.

The bogie is made completely at White, starting with the machining of component parts and their final assembly.

The bogie assembly is composed of a multiplicity of components organized for a variety of machining operations, in which welding plays an important role. For example, the track roller unit is a spool which is built up of a steel tube section machined to take flanges at each end. These flanges are fixed by arc welding. Following a sequence of machining operations, the spool is fitted with rubber tires or wheel sections supplied by Goodrich.

The "crab" assembly is another built-up unit. It consists of two large forgings which are joined by two steel cross-bars to form an H-shaped piece. The cross-bars are attached to the forgings by butt welding, using a Swift resistance welder, shown here. Butt welding is done in two operations, first the welding of the two bars to one forging, then completing the assembly by welding to the second forging.

White has a number of the familiar Blakeslee Niagara metal washing machines in several departments of the plant. One of these is used for cleaning of the various bogie components after machining.

The articulating members of the bogie are fitted with nitrided pins, shoes, bushings, etc., to take the brunt of wear and abrasion. Such parts are nitrided in the two new Electric Furnace units installed in the heat treating department.

Several of the illustrations picture the machining of the bogie bracket, easily the largest single unit of the assembly. These views show the heavy duty milling operations on Cincinnati and Milwaukee milling machines.

After the chassis assembly has been completed and the dash, radiator, and other units have been installed, the chassis is driven under its own power to the plant of another supplier where the body and armor plate structure are installed.

# BORG & BECK

*The Standard Clutch in Peace or War!*



## BORG & BECK DIVISION

BORG-WARNER CORPORATION

CHICAGO, ILLINOIS

# Background for Victory!

## GOOD TOOLS ARE PART OF THE PICTURE

On Consolidated Vultee's vast mechanized assembly lines, where famed Liberator bombers and transports move swiftly to completion, Snap-on tools are part of the picture! Their accuracy, speed and power... their flexibility and ease of application in difficult places... save precious time in countless operations.

Everywhere in the great panorama of America's Production-for-Victory, Snap-on tools play a vital part... dependable aids to fast, accurate workmanship in every phase of production, assembly and maintenance. Write for catalog of 3,000 Snap-on tools, and address of nearest Snap-on factory branch.

**SNAP-ON TOOLS CORPORATION**  
8054-I 28th Ave. • KENOSHA, WISCONSIN

**Snap-on Tools**  
THE CHOICE OF BETTER MECHANICS



## New Production Equipment

(Continued from page 46)

The rate at which filler metal is fed can be adjusted to a constant uniform feed into the arc, or a supplementary control can be used to feed wire into the arc, withdraw it, and then feed it in again—all on a predetermined cycle.

The heart of the manual helium-shielded arc-welding equipment is a specially designed electrode holder which is arranged to hold either a tungsten or a carbon electrode, to conduct the welding current to the electrode and to surround the electrode with a

stream of helium gas. The source of direct-current power for both manual and automatic welding is a standard G-E d-c arc-welding machine.

**T**HE No. 88-A Bliss Mechanical Reducing Press, equipped with "Quick Return Drive," features a constant drawing speed and a quick return speed. According to the maker, the E. W. Bliss Co., Brooklyn, N. Y., an increased number of strokes per minute are obtained without any increase in the



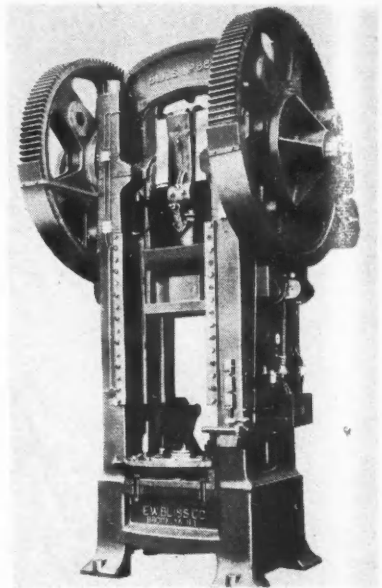
## ONE DOWN... and two to go

From balcony to basement on a single play! That ought to hold you for awhile, Benny. And now, we'll go to work on those two cronies of yours. Not that Arrow, all by itself, can change the course of history. But we're on the team . . . and on the beam . . . and that's what counts in this man's war.

# ARROW

**SAFETY DEVICE CO.**  
MT. HOLLY, N. J.

SEALED-BEAM  
HEADLAMPS  
FOG LAMPS  
MARKER LIGHTS  
SAFETY FLARES  
SIDEVIEW MIRRORS  
REFLEX REFLECTORS  
DIRECTIONAL SIGNALS  
PARKING LIGHTS  
STOP LIGHTS  
TAIL LAMPS  
DOME LIGHTS



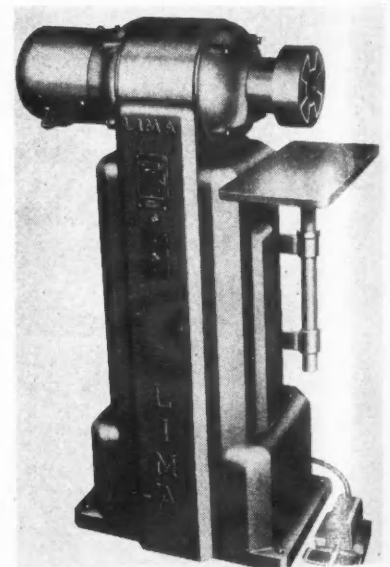
**Bliss Mechanical Reducing Press**  
equipped with Quick Return Drive

drawing speed. The quick return principle resembles the action of planers and shapers in metal cutting.

Twin driving gears are employed on this reducing press to divide the torsional load between two slides and slabs of the shaft. The machine is of four-piece steel tie-rod frame construction and is equipped with a multiple disk, flywheel type, air friction clutch and brake with push button control.

**T**HE Lima Magnetic Polishing Lathe has been designed, by The Lima Electric Motor Company, Lima, Ohio, to eliminate the difficulties encountered in holding odd shapes or sections in a conventional chuck or collet. It is said to be especially suitable for highly finished parts as it leaves no chuck or collet marks. The magnetic chuck holds parts as small as 1½ in. diam.

The unit is furnished with either



*The Lima Polishing Lathe*



# Air Power Through Piston Rings

## McQUAY-NORRIS ALUMINIZED PISTON RINGS

**PISTONS... PINS...  
HARDENED AND GROUND PARTS**



Wherever planes are flying, McQuay-Norris precision parts of un-failing strength help them perform more efficiently and with greater durability. More and more, the aviation industry is availing itself of our 33 years' experience in making precision parts, our metallurgical research, our engineering and technical facilities. We are now direct contractors to the Army and Navy and sub-contractors on precision parts for aircraft, tanks, scout cars and trucks. Your inquiries are invited.

### PARTS FOR AIRCRAFT ENGINES

Piston Rings  
Oil Sealing Rings  
Supercharger Rings  
Carburetor Parts  
Machined Aluminum Pistons  
Piston Pins  
Counterweight Cheek Pins  
Machined Magnesium Parts  
Cylinder Hold Down Nuts  
Hardened and Ground Parts

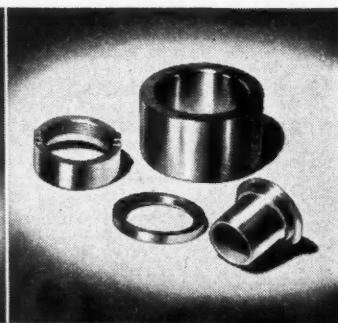
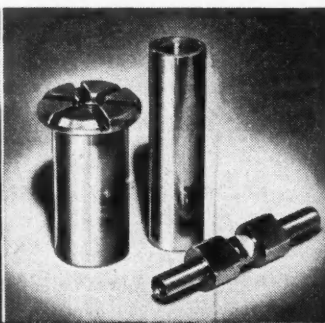
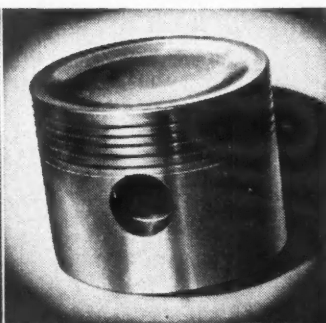
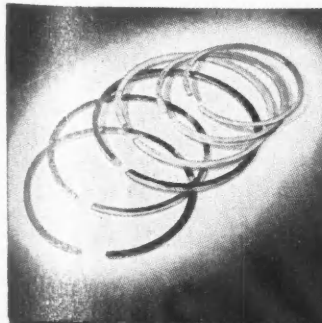
PARTS FOR  
PROPELLER ASSEMBLY  
Machined Magnesium Parts  
Piston Rings

### EQUIPMENT FOR MAINTENANCE OF AIRCRAFT

Pistons for Oxygen  
Compressor  
Piston Rings for Oxygen  
Compressor  
Pins for Oxygen Compressor  
Pistons for Air Compressor  
Pins for Air Compressor  
Piston Rings for Air  
Compressor

LANDING GEAR PARTS  
Machined Aluminum Pistons  
Piston Rings  
Hardened and Ground Parts

**PRECISION WORKERS IN IRON, STEEL, ALUMINUM, BRONZE, MAGNESIUM**



McQUAY-NORRIS MFG. CO. (AIRCRAFT DIVISION), ST. LOUIS, U.S.A.  
CANADIAN PLANT, TORONTO, ONTARIO

single or two-speed motors, 2 or 3 phase, with speeds up to 3600 rpm. A self-contained rectifier unit supplies direct current to the chuck. Interchangeable face plates and register plugs make the machine adaptable to various types and sizes of work.

A foot-pedal control, which can be located in any position convenient to the operator, controls the operations of the lathe. It magnetizes the chuck, starts the motor, stops the motor and demagnetizes the chuck, leaving the operator free to use both hands for handling and processing the work. A magnetic disc-type brake for rapid stopping of the motor and chuck is sup-

plied as standard equipment unless otherwise specified.

A swinging table attached to the pedestal, which can be raised or lowered to accommodate different diameter chucks, holds the parts or pieces to be processed. This can be adjusted to any position convenient for the operator.

**T**HE Wright Centrif-O-Matic, a high speed drill chuck made by the R. M. Wright Co., Royal Oak, Mich., permits the operator to change drills or other tools without stopping the machine. Change of tools is accomplished without cutting off the power by sliding back an outer sleeve on the chuck. This



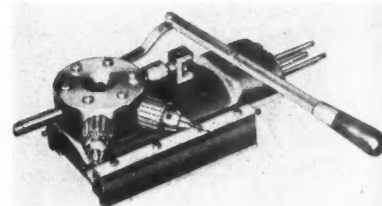
**Wright Centrif-O-Matic Drill Chuck**

releases a centrifugal lock and permits the tool and its adapter to be removed. A new tool is inserted and the sleeve snapped back in position, locking the tool centrifugally.

Drill adapters for the Wright Centrif-O-Matic are available to accommodate drill sizes from 1/16 in. to 9/32 in., letter drills from A to K, and wire drills from 1 to 60.

**A** SELF-INDEXING bed-turret, with six tool stations and six individual stops indexing with the turret, is the latest development of Kessler Aero Tool Co., Burbank, Cal. Back-indexing by hand to speed production when using less than a full set of six tools, is one of the features of this new lathe attachment as outlined by the manufacturer.

Indexing bushings and lock pins are of hardened and ground tool steel.

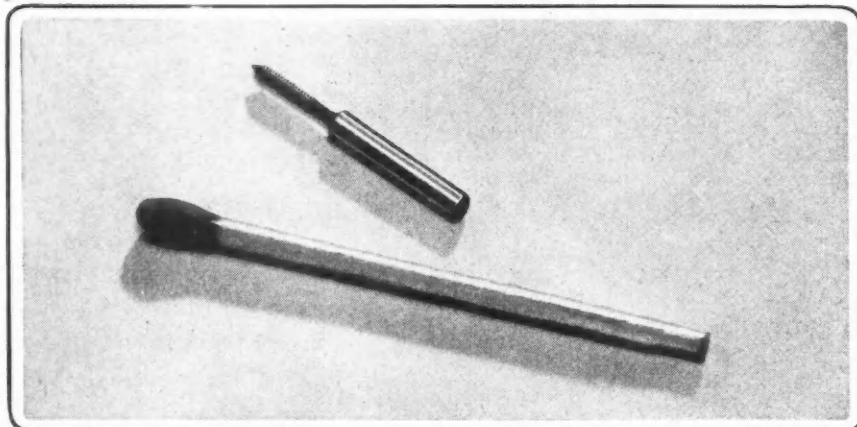


**Self-indexing Bed-turret**

Turret head is mounted on a pre-loaded Timken bearing, which can be adjusted for wear. Ways are hand scraped. The attachment is lever operated and has a maximum stroke of 4 in. with a minimum index stroke of 1 1/2 in. and total travel, including the index, of 5 1/2 in. The turret is shipped completely finished and assembled except for turret holes which are left to be bored on the individual machine.

**I**NDUSTRIAL ABRASIVES, INC., Chicago, Ill., is now delivering diamond impregnated wheels made by a new molten metal process. The alloy used is said to be sufficiently hard to anchor every diamond particle, holding each in place, yet soft enough to abrade away as necessary, and to bring other layers of diamond particles into position for con-

## *a* MATCH STICK



## dwarfs this **PERFEX** gage

**T**he comparison between Perfex's 0-80 Male Thread Gage and a match, graphically illustrates what Perfex can do in maintaining fine accuracy even in the most minute gage.

With the high standards required in today's aircraft industry, on all parts regardless of size, manufacturers have come to recognize Perfex's reliability in adhering to the extremely close limits that are being specified.

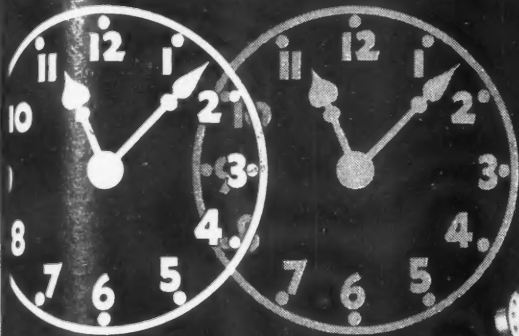
If your requirements in gages are being held to closer limits why not write us for information on Perfex's line of gages today?

*Perfex Manufactures Thread, Plug, Radius, Contour, Profile, Flush Pin, Solid Snap, and Specials to Your Blueprints.*

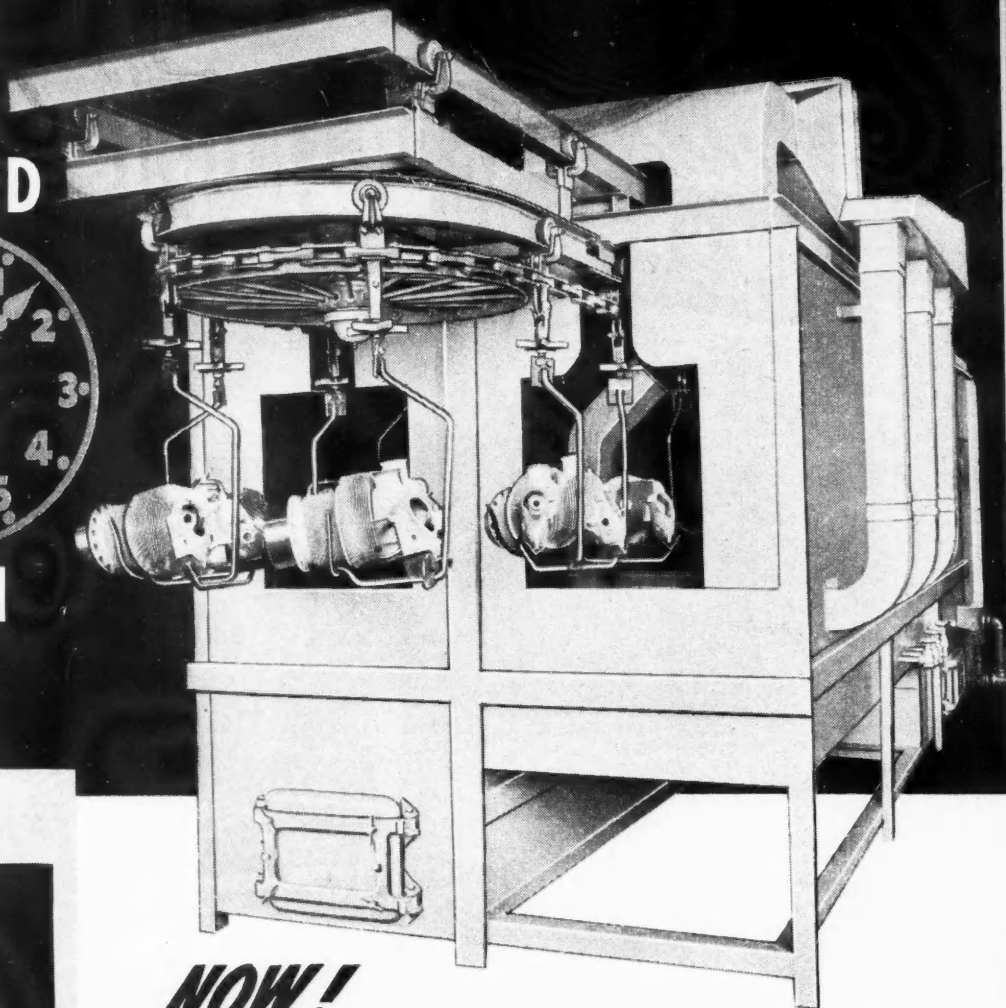




# SYNCHRONIZED



# PRODUCTION



## NOW!

## *Cleaning Airplane Engine Parts*

### HAS BEEN TIMED

### WITH THE PRECISION MACHINING OPERATION!

**MASS** production methods call for new techniques in cleaning and indoor transportation methods. And it is in these two fields that A-F Engineers can help you most.

For instance, this A-F Machine for speed-washing, rinsing and drying cylinder heads and head and barrel assemblies of airplane engines is more efficient because it performs a complete cleaning operation timed with the precision machining operation.

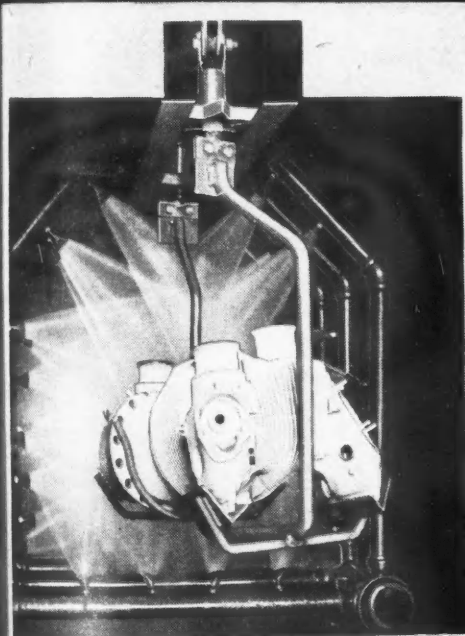
The conveyor operates as a continuous loop so that it can be loaded and unloaded at the same end.

A trolley swivel attachment equipped with star wheel turns parts as they pass through spray and exposes all surfaces to the cleaning solution. Carrier is so designed that cleaning solution and rinse water drain out of all crevices and pockets of parts being cleaned.

Write for full details—new folder—or a consultation with A-F Engineers—today!

The **ALVEY-FERGUSON COMPANY**, 163 Disney St., Cincinnati, Ohio

Affiliated Company: The Alvey-Ferguson Company of California  
Slauson and Santa Fe Avenues, Los Angeles, Calif.



THIS CLOSE-UP photograph clearly shows the complete coverage of high-pressure fan-shaped spray through which cylinder heads and head and barrel assemblies must pass. No wonder A-F machine-washed products are cleaner!



## CONVEYING EQUIPMENT



# Alvey-Ferguson

## METAL PRODUCTS CLEANING & FINISHING EQUIPMENT



# Consider BAKER TRUCKS

## FOR PROBLEMS LIKE THESE

**A**

**PROBLEM:** To speed assembly operations of bombing and fighting planes.

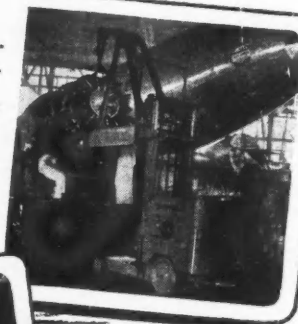
**SOLUTION:** Baker Crane Trucks handle heavy cumbersome parts quickly and easily, spotting fuselages, engines and propellers in position on assembly lines.



**B**

**PROBLEM:** To speed maintenance of air transports.

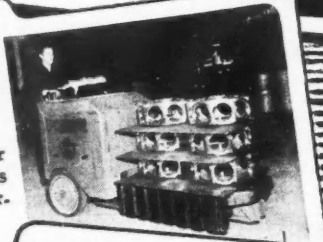
**SOLUTION:** Baker Fork Truck with crane attachment cuts time of removing and installing motors and carrying them quickly to and from test stands.



**C**

**PROBLEM:** To step up handling efficiency in a large airplane engine plant.

**SOLUTION:** A fleet of Baker Low-Lift Trucks saves many hours daily in inter-plant transfer of crank cases and other heavy parts.



**D**

**PROBLEM:** To cut idle time of presses in a plant working at full capacity turning out pursuit and fighter planes.

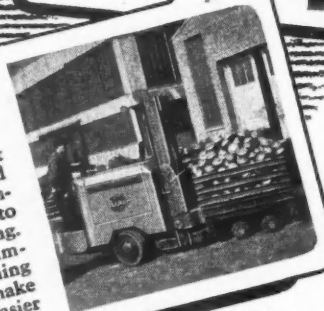
**SOLUTION:** Baker Hy-Lift Trucks with die-pulling winch reduce time required for die-changing, and also speed movement of dies between storage and presses.



**E**

**PROBLEM:** To speed handling operations in a forge plant making aircraft parts.

**SOLUTION:** Baker Hy-Lift Trucks carry heavy forged parts quickly from hammers to heat-treating, to finishing and to shipping. Trucks also serve hammers with dies weighing up to 2 tons, and make millwright work easier and safer.



In many other plants where production is assuring American air supremacy, Baker Trucks are playing a vital part.

If you have handling problems similar to those above, a Baker Material Handling Engineer can help you find the correct solution.

**BAKER INDUSTRIAL TRUCK DIVISION of the Baker-Raulang Co.**

2154 WEST 25th STREET • CLEVELAND, OHIO  
In Canada: Railway and Power Engineering Corp., Ltd.

**Baker INDUSTRIAL TRUCKS**

tinuous cutting. The depth of the diamond impregnation is 3/32 in. on face type wheels, and 1/8 in. on the periphery type wheels. The line includes face type and chip breaker type wheels in a variety of sizes, as well as wheels for special applications. Fine mesh wheels are also being produced for honing tool bits after they have been ground.

**F**ELLOWS Gear Shaper Company, Springfield, Vt. is offering a shaving machine adapted particularly to the shaving of small fine-pitch gears. This machine will handle gears up to 4-in. pitch diameter, and 20 diametral pitch, and finer. The work is held on fixed centers located in adjustable head and tail-stocks.

On this particular machine, the work-slide, instead of the shaving tool, is reciprocated. This reciprocating movement to the work-slide is imparted by a crank mechanism, which slowly traverses the work across the shaving tool. The worktable is adjustably mounted



*Fellows No. 4 Gear Shaving Machine*

on this slide so that it can be set for correcting taper.

The head carrying the shaving tool is adjustable for crossed-axes setting, having a maximum angular movement of 20 deg. both sides of the center.

The machine is provided with complete electrical push button control, both for the operation of the tool and reciprocation of the slide. Accurate means are also available for setting the tool relative to the work, a dial graduated in 0.0005 in. being available. Once the machine is set, the proper depth is maintained by means of a depth feed cam. The tool-spindle is driven by a separate motor mounted in

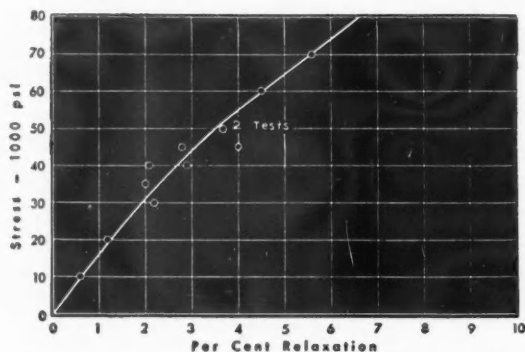
# Inconel Springs

## Hold Load Loss to Minimum

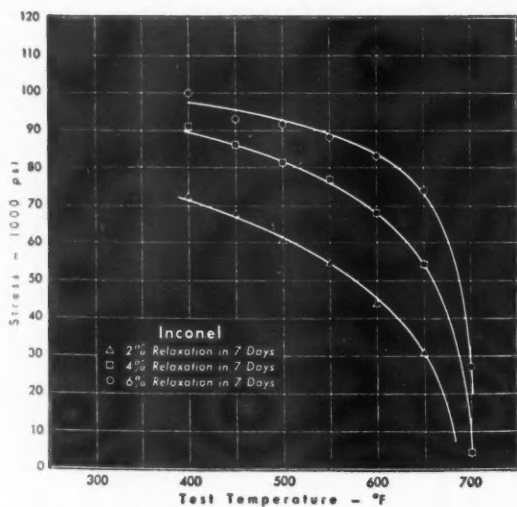
### At Elevated Temperatures

At temperatures up to 650° F. and under high stress Inconel springs successfully resist relaxation or load loss. Above this point, Inconel still gives remarkable service, though stress must be lowered considerably and some relaxation tolerated.

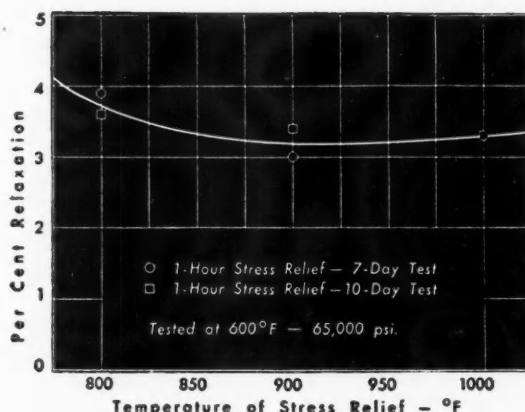
The following tests, made in cooperation with the A.S.M.E. Special Research Committee on Mechanical Springs, graphically show the unique properties of Inconel.



(1) Stress versus Relaxation in 7 days; Inconel at 650° F.



(2) Stress required to produce 2, 4 and 6 per cent relaxation of Inconel Springs in 7 days.



(3) Effect of Stress-equalizing Temperature upon the relaxation of Inconel Springs in 7 and 10 days. (Tests run at 600° F. and 65,000-psi stress.)

The springs tested were 1 1/4 in. OD, 2 3/4 in. free height and had 6 1/4 total coils. They were made of 0.148" diameter wire.

The graphs are based on behaviour of these springs loaded to a constant height. It is probable that, within stress and temperature limits which would produce not more than 10% relaxation, these results are also applicable to cases involving constant load.

Inconel Springs... helical, spiral or flat, of every shape and size... have high endurance limit, good strength, unusual stiffness. Inconel is immune to rust and highly resistant to oxidation and corrosion.

The bulletin "Relaxation Resistance of Nickel-Alloy Springs" reports the tests shown above and gives similar data on the relaxation resistance of Monel, "Z" Nickel and "K" Monel springs. This report also includes curves showing results of tests to determine the best stress-relief treatments for Monel and Inconel springs, and also curves and formulae showing changes in torsional modulus at high temperatures for each of these spring materials.

Copy of the bulletin and additional information on request. Write The International Nickel Company, Inc., 67 Wall Street, New York, N. Y.

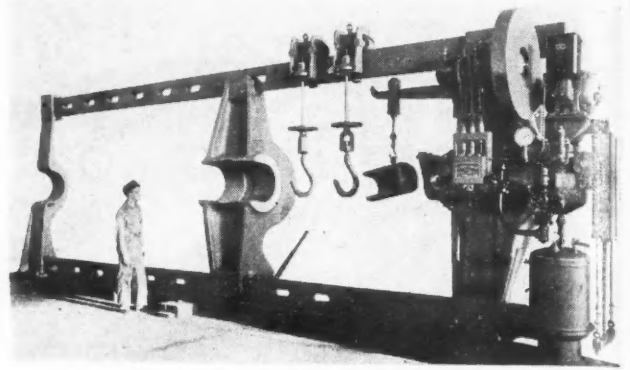
## INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • NICKEL • "Z" NICKEL  
Sheet... Strip... Rod... Tubing... Wire... Castings

the feed slide. The motor which drives the work-slide, also operates the compound pump, and is provided with a plugging switch to prevent coating of the slide.

**R.** D. WOOD CO., Philadelphia, Pa., has designed and built a self-contained hydraulic wheel press with pneumatic pullback. There are openings of 10 in. radius provided both in the resistance post and the end post to accommodate the work. The resistance post operates on bearing equipped rollers, on the machined face of the base plate, for easy movement in either direction. Where the use of a stop plate is necessary, a recess having an 11 in.

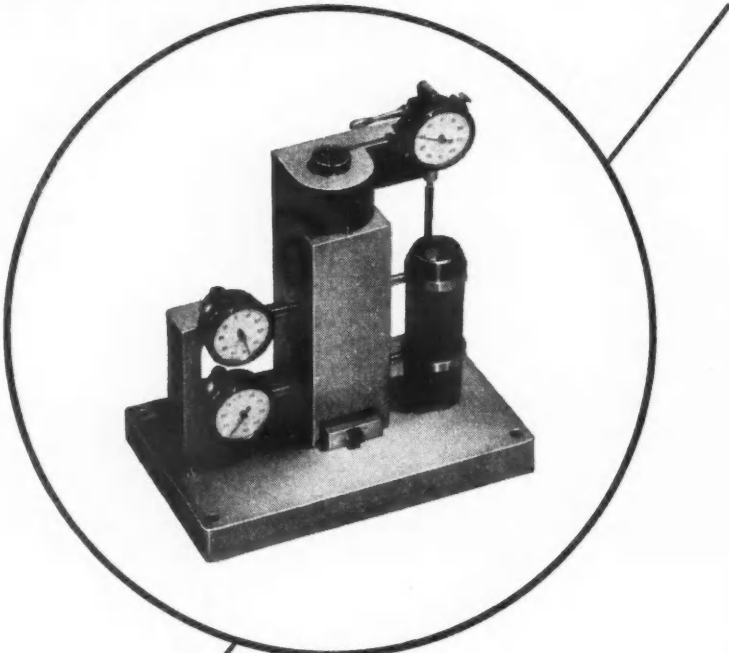
*Wood 600-ton Hydraulic Wheel Press*



radius has been provided in the resistance post, in which the plate is inserted.

The pump is of the vertical, triplex, two-pressure type, having one low pressure and two high pressure plungers, actuated by three eccentrics. The ram travel is 26 in. Its approach speed is 70 in. per min. Ram speed at low pressure is 10 in. per min.; at high pressure, 3 1/4 in. per min. Return speed is 40 in. per min. Maximum capacity at high pressure, 600 tons; at low pressure, 100 tons.

The press can be installed flush with the floor. A pneumatic pullback device is incorporated which not only does away with the necessity of providing a pit to accommodate counter-weights, but also gives a faster rate of ram return than the customary ballast weight.



## SPECIAL GAUGES by TURNER



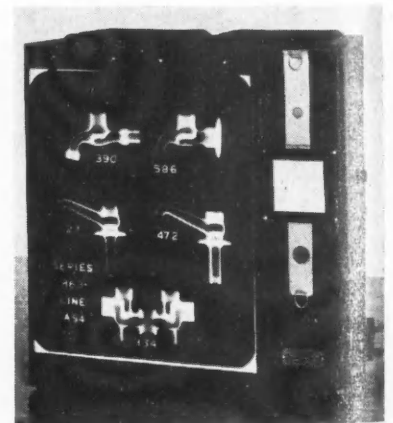
Illustrated above is a Special Gauge made by Turner. This gauge is just one of the hundreds of Special Precision Gauges Turner makes for manufacturers who require their own particular type of gauge to check certain precision operations on their production lines. Turner's Engineering Department has played an important part in assisting in the design of these gauges and the Turner Company invites you to write them if you have a checking problem that requires a special built gauge.



**TURNER GAUGE GRINDING COMPANY**  
2622 HILTON ROAD • • • • FERNDALE, MICH.

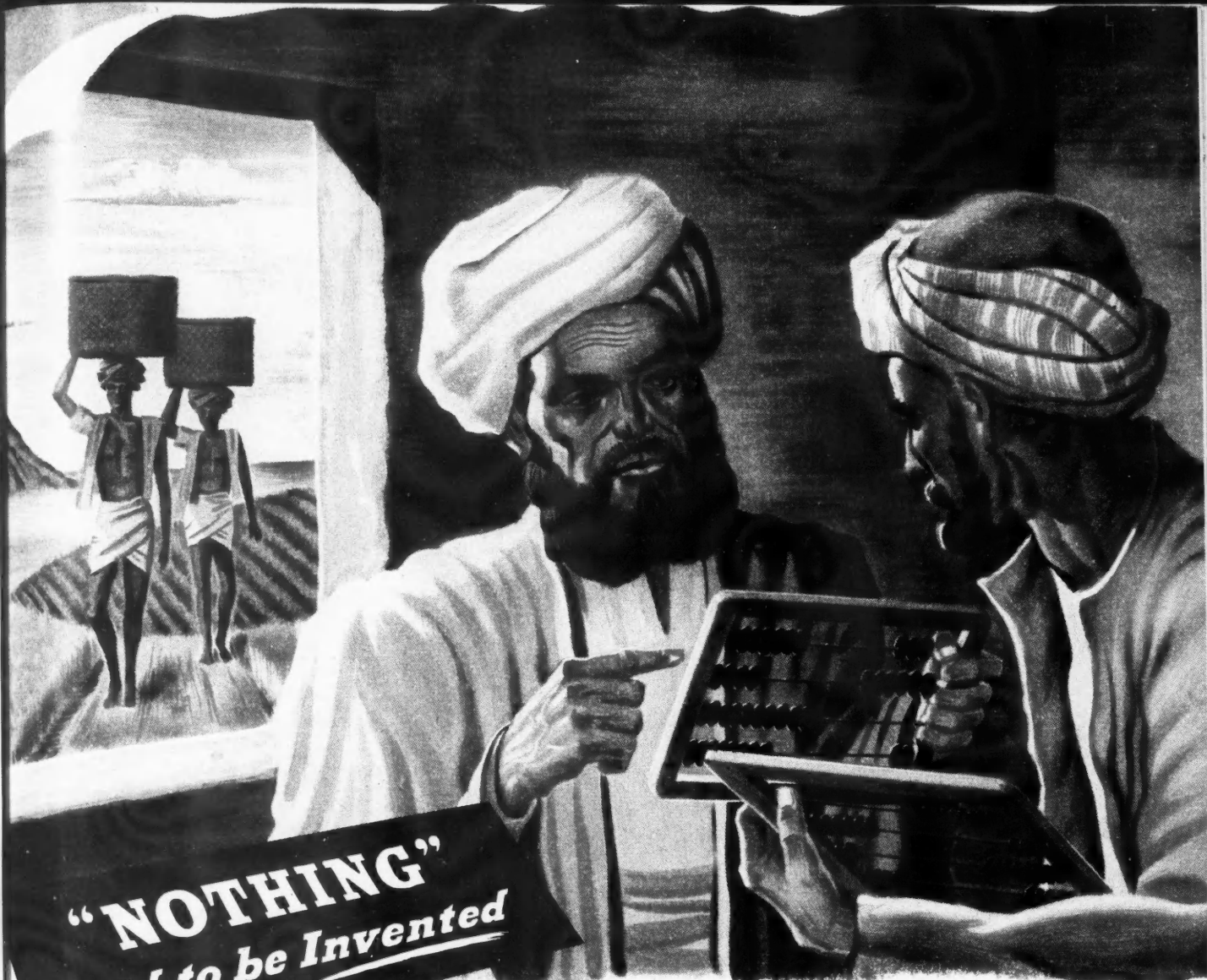
**T**HE Kelley-Koett Manufacturing Company, Covington, Ky., makes available a high intensity industrial illuminator. Providing four times more illumination than heretofore available, it is said to permit observation of film detail formerly missed with weaker light sources. This increased intensity also makes it possible to use films of greater density with the resultant improvement in radiographic contrast. The Keleket High Intensity Illuminator raises the usable density from 1.5 to more than 4.0.

The view box is equipped with a Variac control which affords a stepless increase in intensity by varying the voltage from 0 to 110 volts. By means of this control the exact amount of



*Keleket High Intensity Illuminator*



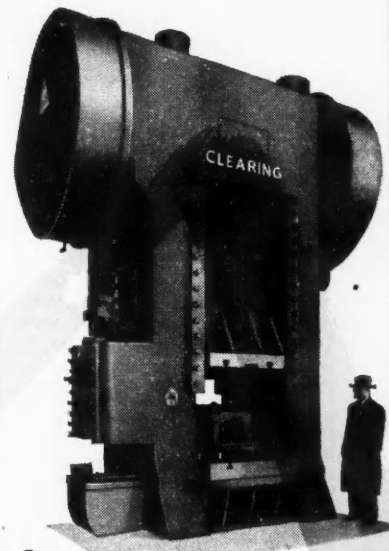


**"NOTHING"**  
*had to be Invented*

Modern mathematical computations would be impossible without the symbol O, which permits us to indicate the position and hence the value of a digit. Mankind very early learned to make marks representing various numbers, but the concept of a mark to represent nothing at all—actually, an empty column in the counting frame—was a daring departure which opened a whole new world. To the vision and initiative of an unnamed Hindu, circa 100 B.C. we thus owe the ability to achieve present day engineering wonders.

Obviously the huge presses that Clearing designs and builds would be physical impossibilities without the assistance of exact mathematical reckoning. And today, as always, vision and initiative are still vital counterparts of constant progress.

That the men who build Clearing presses possess these qualities is evident by the presses they have built. Often it has been a Clearing Press that has provided the way for a faster and better production method. Therefore when you face a production problem that can or might be solved by a press, may we suggest that you come to Clearing. CLEARING MACHINE CORPORATION 6499 W. 65th St. • Chicago, Illinois



**CLEARING PRESSES**  
MECHANICAL AND HYDRAULIC

light necessary to observe details at various film densities can be obtained.

The Illuminator is a full 14 in. by 17 in. so that even the largest film can be viewed without repositioning. Masks are used to reduce the illuminated surface when films smaller than 14 in. by 17 in. are examined.

Films are protected from the heat of the photo-flood lamps by the cold front. A heat absorbing glass baffle and cooling fans which circulate 900 cubic feet of air per minute, dissipate all excess heat even during continuous operation.

A 3 inch spot with four times the intensity of the large front surface permits intensive examination of critical areas on the film.

**T**HE Bridgeport Safety Emery Wheel Co., Bridgeport, Conn., has just announced the No. 47 Abrasaw cut-off machine. The base is a single casting containing the coolant tank. Automatic coolant control is regular equipment, but for laboratory work or other uses where speed of production is not essential, hand coolant control can be supplied. The machine is equipped with a 5 hp ball bearing motor, and handles solids up to 1 in. or tubing and light sections up to 2 in. A ¼ hp coolant pump is furnished to supply coolant to the cutting disk. Vises can be furnished for straight cuts only, or in the combination straight and angle type.



No. 47 Abrasaw Cut-off Machine

**MASTERY**  
OF THE AIR ON  
THE HOME FRONT  
IS NEEDED FOR  
VICTORY TOO!

Engineered Dust Control on the home front is as essential to Victory as air control on the war front, for the battles of production—like battles between armies—are more easily won after mastery of the air is achieved.

In many of America's fast producing industrial plants, American Air Filter equipment is protecting materials in process, reducing rejects, increasing worker efficiency and lowering maintenance costs. Write for free bulletins.

Send for your copy of "AAF in Industry"



**AMERICAN AIR FILTER COMPANY, INC., 449 CENTRAL AVE., LOUISVILLE, KY.**

IN CANADA, DARLING BROTHERS, LIMITED, MONTREAL, P. Q.

**N**ORTH AMERICAN PHILLIPS COMPANY, INC., New York, N. Y., is now delivering a new electronic temperature indicator. A switch on the front panel allows selection of three temperature ranges. The standard limits of the instrument are from -100 deg. C. to 1000 deg. C, with a normal accuracy of plus or minus 2 per cent.

Five pairs of terminals for five thermocouples are provided, any one of which can be switched into the circuit

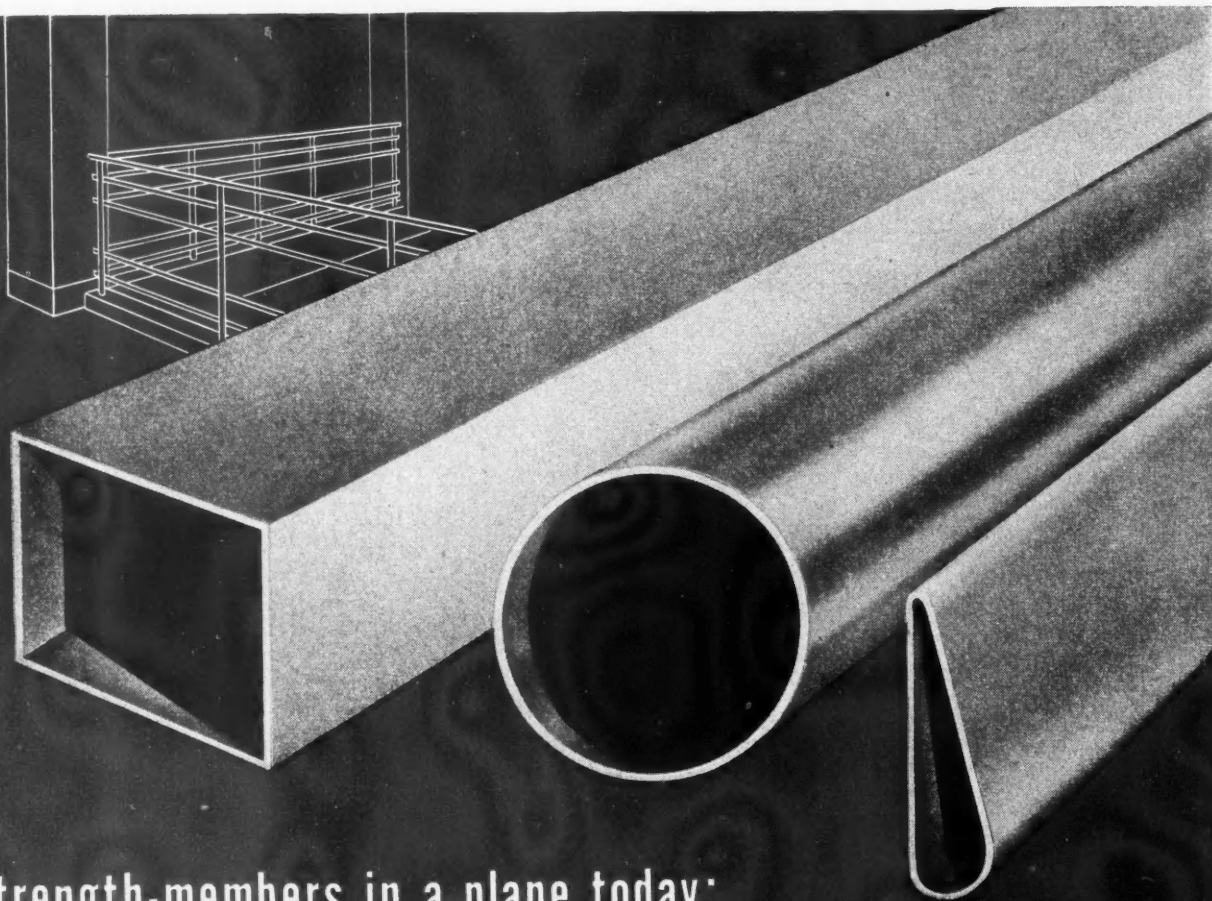


Electronic Temperature Indicator

so that the temperature at five different points can be read. Since the connecting wires between the thermocouples and the instrument carry only the small fractional voltage of the thermocouples, no special provisions are necessary for insulation, and varying lengths of thermocouple leads do not affect the calibration.

**T**HE Mechanics Engineering Company, Jackson, Mich., offers an improved design of cable splicer known as the Universal No. 101. It requires no adapters to handle the several sizes and types of thimbles and bushings most widely used. They are held by means of a sprocket chain and powerful jaws. Adjustment of the chain hold to various sizes of bushings and





Strength-members in a plane today;

*important job for you tomorrow*

You probably knew Alcoa Aluminum tubing, before the war, maybe as handrails and similarly decorative-utility items of construction. You may have employed it as conduit, where corrosion was a problem, or as bus bar for its high electrical conductivity and light weight. You may have utilized its high heat conductivity in heat exchangers. Lightweight, durable metal furniture made of aluminum tubing was in demand.

The war is opening new vistas to aluminum tubing. Made of high strength alloys, this tubing provides the necessary combination of light weight and high strength required for military aircraft. Shapes may be simple or complicated, according to the task they are put to. Various

methods of finishing the metal also have been employed to increase its usefulness.

Properties that make Alcoa Aluminum tubing invaluable for war work are also advantages which will appeal to designers, manufacturers and buyers of industrial equipment and future peacetime products. Weights can be reduced and operations speeded up without sacrificing dependability. Corrosion and heat transfer problems can be licked. Appearances can often be improved and upkeep costs reduced.

A wide range of standard sizes and shapes of Alcoa Aluminum tubing will be available to you for "tomorrow's" products. ALUMINUM COMPANY OF AMERICA, 2110 Gulf Building, Pittsburgh, Pennsylvania.

**ALCOA**  **ALUMINUM**

September 15, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

101



*This is a true story of one of the many contacts made by Square D Field Engineers which have resulted in increased production or reduced costs.*



## **"Every time a conveyor gets stuck . . . so do we . . . to the tune of \$700 and lost production time!"**

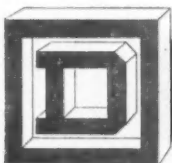
An enamel parts manufacturer's process depended upon a series of ingenious conveyors. They carried the materials into huge bake ovens, kept them there for an exact period, then carried them out.

But a vicious cycle of complications was causing heavy losses in time and material. The intense heat led to evaporation of lubrication which "froze" the conveyors. This, in turn, overloaded motor circuits and blew fuses. By the time the breakdown was detected, materials stymied in the ovens were burned beyond salvage.

A Square D Field Engineer was called in. He studied the problem—solved it by the installation of the proper design of Square D circuit breaker, which held the circuit closed against minor "freezings" and gave workmen an *immediate visual* warning of serious trouble. The cost was negligible—the savings in time and money *substantial*.

### **Let a Square D Field Engineer Help You**

You'll find a Square D Field Engineer a source of sound counsel whenever you are confronted with problems of electrical control or distribution. He can help you simplify new jobs and do old ones better. And backing him up in every Square D plant, are design and engineering specialists with complete research and testing laboratories at their command. There are Field Engineers in Square D branch offices in 48 principal United States and Canadian cities.



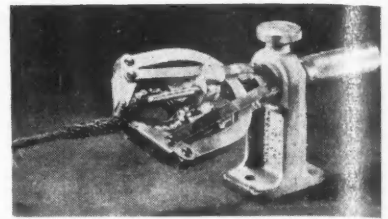
ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

# **SQUARE D COMPANY**

DETROIT

MILWAUKEE

LOS ANGELES



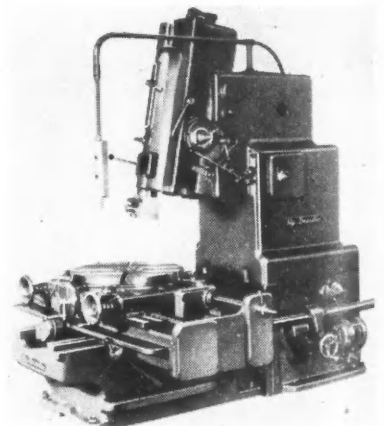
**No. 101 Universal Cable Splicer**

thimbles is made by setting and locking a button.

The Universal Splicer can be used in the standard furnished, which can be bolted to a bench. Also, it can be set in a vise or held in the hand. It is said to prevent any bulge in the cable. Tendency to bulge is controlled by the chain as the splicer is tightened around the bushing.

**T**HE 12-in. Hy-Draulic Slotter, manufactured by the Rockford Machine Tool Co., Rockford, Ill., features hydraulic ram-drive, manual and hydraulic longitudinal and transverse feeds, and power rapid traverse. It also has manual and hydraulic rotary feeds to table, with power rapid traverse.

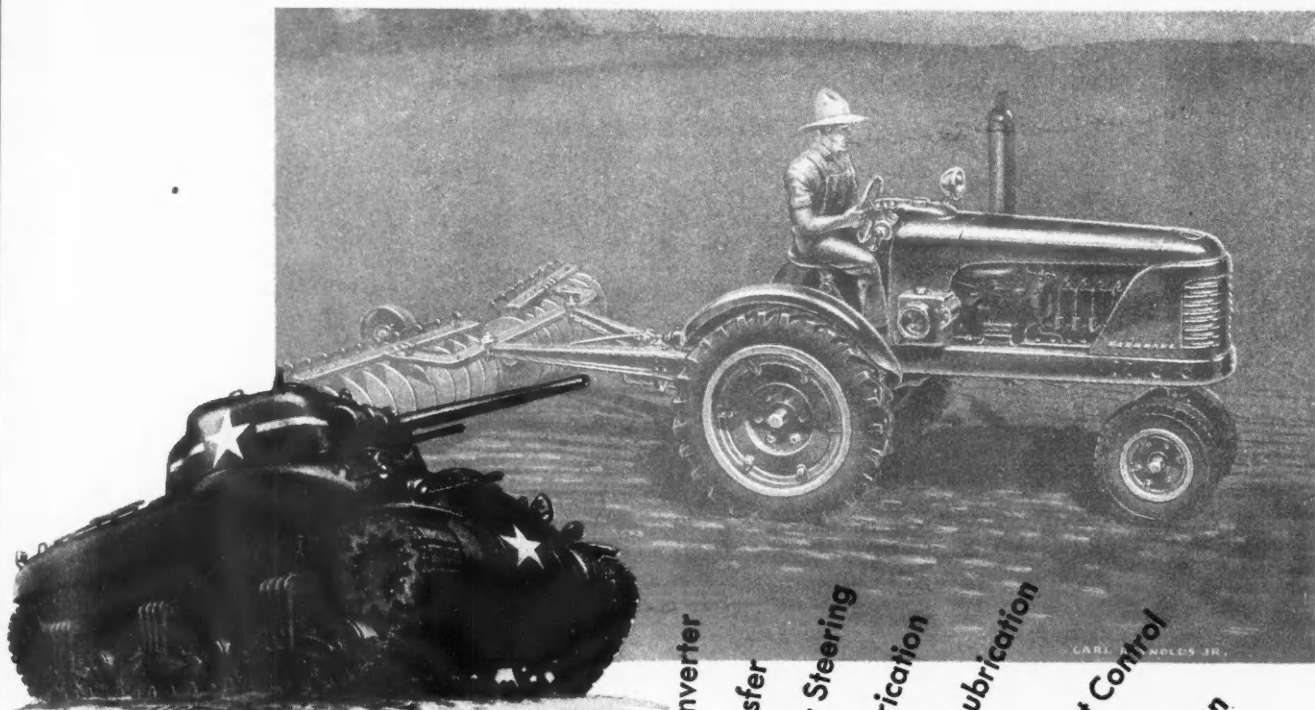
The machine has a maximum stroke of 12 in. It will slot to the center of a 48 in. circle. There is approximately 18 in. minimum space under the ram guide. Cutting speeds are infinitely variable between 10 ft and 75 ft per minute; maximum return speed is 100 ft per minute.



**Hy-Draulic Slotter**

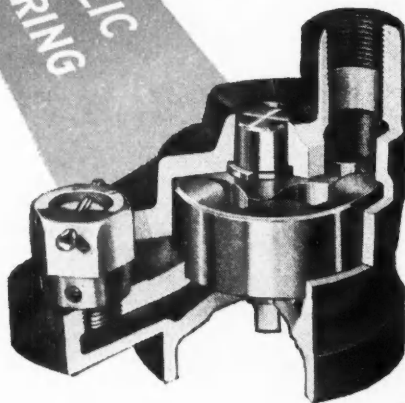
Hydraulic feed to table is infinitely adjustable between zero and 0.106 in. per cutting stroke for transverse movement, between zero and 0.053 in. for longitudinal movement, and between zero and 0.106 in., on a circle 6 in. in diameter, for circular movement.

**Invest in the  
American Way—  
BUY WAR BONDS**



HYDRAULIC  
ENGINEERING

Torque Converter  
Fuel Transfer  
Hydraulic Steering  
Engine Lubrication  
Transmission Lubrication  
Hydraulic Implement Control  
Crankcase Pressure Ventilation



As in today's vehicles of war—where the Eaton Rotor Pump has proven itself *under fire*—so in tomorrow's vehicles of production, hydraulic power is destined to play a highly significant role. Of prime importance is an efficient and dependable pump.

Every Eaton Rotor Pump is literally "tailor made" to your specific requirements. Eaton hydraulic engineering facilities are at your disposal in designing hydraulic systems.



## EATON ROTOR PUMP

ENGINEERED AND MANUFACTURED BY THE WILCOX-RICH DIVISION  
OF EATON MANUFACTURING CO., 9771 FRENCH ROAD, DETROIT

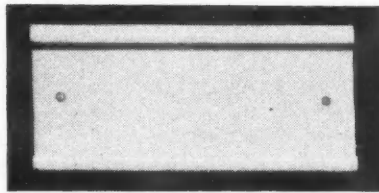
## New Products

(Continued from page 62)

### Plastic Stock Room Bin Card Holders

Plastic stock room bin card holders in a variety of shapes and sizes are the latest addition to the line of the Hollywood Athletic Company, Los Angeles, Cal. Stock widths of  $\frac{5}{8}$  in.,  $\frac{7}{8}$  in., and  $1\frac{7}{16}$  in. may be had in any of the standard lengths of 3 in., 4 in., or 5 in.

The device is applicable to any flat surface by means of tacks or glue. It consists of the plastic holder, an insert



Plastic stock room bin card holders made by Hollywood Athletic Company

# FLYING STEEL

From Atlas in the Army  
and Navy's greatest bombers  
softens up the tough spots in  
Axis resistance and makes  
the way easier for Allied  
armies all over the world.

**ATLAS DROP FORGE COMPANY**  
LANSING, MICHIGAN

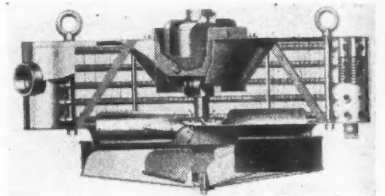
tab on which descriptions of the article may be typed, and a covering sheet of transparent plastic. Changes are made by inserting revised card slips.

### Vertical Delivery Unit Heaters

A new series of vertical delivery unit heaters with steel condensers is announced by the Modine Manufacturing Company, Racine, Wis. Units range in capacity from 620 Edr (149,000 Btu/hr) to 2500 Edr (600,000 Btu/hr).

Designed for wartime application, steel condensers are protected against corrosion by a coating of lead alloy. Tube and fin assemblies are completely submerged in molten lead alloy which provides a corrosion resistant coating over their entire surfaces.

Fins are permanently bonded to tubes with metal, sealing the heat transfer



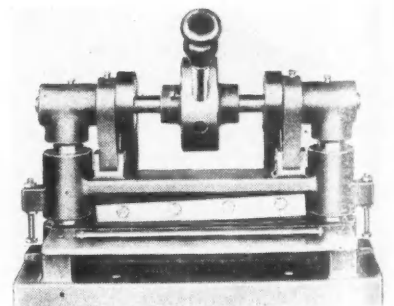
Modine Vertical Delivery Unit Heater

contact of fin to tube from the corrosive action of air and its impurities. Tubes and headers are brazed with silver solder to form an integral unit of steam carrying passages guaranteed for working steam pressures up to 150 psi.

The new series of Modine Verticals is available with standard Cone-Jet deflectors or with Modine Truncor deflectors or Anemostats to meet practically any air diffusion requirements.

(Turn to page 106)

### Improved Di-Acro Shear No. 2



The improvements in this model include increased weight and greater rigidity. Maximum shearing width is 9 in. Maximum shearing capacity, full width, is 22 gage steel plate. Shear blades are reversible, offering double service without re-sharpening. The Di-Acro shear is made by the O'Neil Manufacturing Company, Minneapolis, Minn.



# ELECTRONIC

Resistance Welding Control



# Silent PARTNER

## FOR FASTER, STRONGER, RESISTANCE WELDING



### VITAL MATERIALS SAVED

Eliminates rivets. No flux or solder required.



### INCREASED PRODUCTION

Fewer welds are necessary when all are of uniform strength. Less preparation and finishing required.



### FEWER REJECTS

Accurate control of timing eliminates weak welds and burned material.



Electronic control is a natural partner for resistance welding. It gives micro-accuracy in the variables that go into making strong, precision welds—weld time and heat. It controls high currents noiselessly, efficiently.

Westinghouse supplies all the necessary equipment for electronic control of resistance welding. Two typical units are illustrated above, mounted on a spot welder.

- 1 **WELD-O-TROL** "makes and breaks" heavy welding currents as high as 10,000 amperes with no arc, no noise. Complete absence of moving parts eliminates the noise and maintenance of mechanical contactors.
- 2 **AUTOMATIC WELD TIMER** controls duration of weld and sequence of electrode operations. Precision control to within one cycle or 1/60 of a second produces welds of uniform characteristics—even in mass production.

Specify Westinghouse controls to improve both production rates and consistency of weld quality. Ask your Westinghouse representative for recommendations and descriptive literature. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21274

# Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

## RESISTANCE WELDING CONTROLS

September 15, 1943 When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

## Temporary Protective Coating for Metal

A temporary protective coating for steel, copper, brass and aluminum is being offered by INSL-X Co., Brooklyn, N. Y. A thin film applied by brush or dip air-dries at a maximum of 15 min, depending on atmospheric conditions. In a clear, dry day 5 min only is required.

Use of this product is said to eliminate greasing and other protective methods. When it is desired to remove coating it is easily stripped off by hand; no solvents being necessary. An advantage is that parts require no

cleaning other than stripping to be ready for use.

It covers equally well on all finishes, from rough to smooth, and on complicated forms covers all edges, without danger of flowing away.

This product is manufactured in two forms: 002, for short-term protection; 003, for long periods of storage.

## Fitting for Wire Rope

The Gar-Bro "Shimble," a product of Garlinghouse Brothers, Los Angeles, Cal., is forged from heated steel plate and shaped to the correct rope radius, so there can be no distortion

under load with consequent rope damage. It may be welded to other attachments, or the side plates may be bent to fit special conditions. Made with open and closed ends, the "Shimble" is



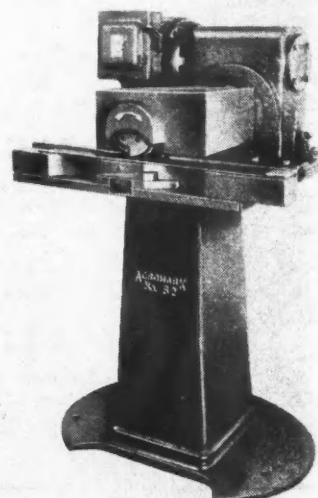
The Gar-Bro "Shimble"

adaptable to a multitude of uses wherever shackles or sockets are used, such as guy anchorages, tractor hitches, crane slings, or equalizers. Gar-Bro Shimbles are available in all rope sizes from  $\frac{3}{8}$  in. to 1 $\frac{1}{2}$  in.

## New Adhesive for Weatherproof Boxes

E. I. du Pont de Nemours and Company, Inc., Wilmington, Del., have developed a special adhesive for use in the manufacture of weatherproof fiberboard containers. Boxes or other containers made by laminating four to eight sheets of heavily sized paper together with this water-soluble vinyl resin are said to be so weatherproof that they can be submerged 24 hr without falling apart.

## Acromark No. 52 Power Marking Machine



The operator feeds flat stock into this machine as he would feed a punch press, the marking roll slides it to the left as it rolls in the mark, then an automatic ejector removes the work from the machine. A wedge arrangement permits adjustment for marking depth.

*Here's Why* **TRU-LINE DIAMOND TOOLS**  
**SAVE MONEY—  
SPEED PRODUCTION!**

Designed for straight, profile and step dressing operations, TRU-LINE TOOLS are engineered to the job by craftsmen whose many years of experience have taught them the proper application of industrial diamonds and diamond tools to all types of production jobs. TRU-LINE TOOLS embody these money-saving and time-saving features:

- 1 NO TURNING**—diamonds contact wheel at right angles to wheel axis . . . no turning of tool necessary . . . patented blade does not glaze, is always free cutting.
- 2 OVERLAPPING ROWS**—diamonds contacting wheel cut in same line . . . rows overlap—as one row is used another row is in cutting position . . . a continuous cutting surface is thus obtained.
- 3 THIN BLADE**—dissipates heat rapidly . . . diamonds held securely by chemical reaction between diamonds and patented matrix alloy until entirely used up.
- 4 SELECTED DIAMONDS**—the machine, wheel grain texture, wheel hardness and characteristics of piece to be worked are considered in selecting diamonds for TRU-LINE TOOLS . . . smaller diamonds cut tool costs.

★ **SEND FOR THIS FREE BOOK TODAY!**

Learn of the many other money-saving and time-saving features of TRU-LINE TOOLS. This new book gives complete details with prices. Send for it today!

**WHEEL TRUEING TOOL COMPANY**  
3200 W. DAVISON DETROIT 6, MICH.

# DURO-CHROME

## *...a Doggone Good Tool!*



Today, those of you with Duro-Chrome tools can really appreciate why it pays to buy good tools.

For in these days of new tool scarcity, the ability of Duro-Chrome tools to stand up and retain their new tool precision is mighty important! No time and tempers lost trying to make a makeshift or damaged tool do, when you've got Duro-Chrome tools in your kit.

This Duro Durability didn't just happen . . . it is the product of a billion tool experience!

While war production must necessarily come first, every effort is being made, insofar as consistent with war requirements, to provide you with such Duro-Chrome tools as are essential to your job of Keeping 'Em Rolling.

Duro Metal Products Co.,  
2649 North Kildare Ave., Chicago, Illinois.

# DURO TOOLS (HAND TOOL DIVISION)



*The Mechanic's Best Friend*  
OVER A BILLION BUILT SINCE 1916

ALSO MAKERS OF DURO MACHINE TOOLS

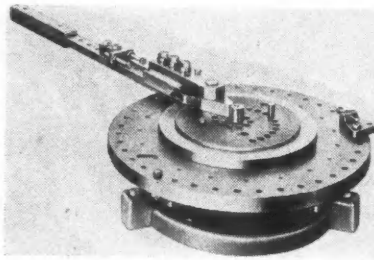


## New Products for Aircraft

(Continued from page 42)

eliminated by reversing operating direction of the unit.

The operating lever is 35 in. in length, and increased leverage up to a total of 80 in. may be added. Half-inch cold rolled steel bar can be formed cold to 1 in. radii or larger. Twelve right or left hand operating positions for either bench or pedestal mounting are provided with the standard Bender. Heavy holddown lugs fasten the unit in the desired operating position.



Di-Acro Bender No. 3

**PERFORMANCE WILL STILL BE THE**

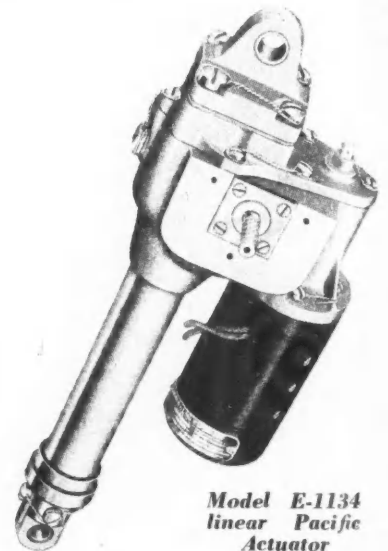
**No. 1 Feature  
OF NEW MODELS**

● Automotive manufacturers busy with the war—including ourselves—dream sometimes of tomorrow, the big new car market, the new models. Let this be a reminder to put Dole Thermostats on those models, even in your dreams. Automotive designers specified motor temperature controls in the first place to improve performance—a reason which holds good on any model.

**THERMOSTATS**  
**the DOLE** valve company  
Established 1906  
1901-1941 Carroll Avenue, Chicago 12, Illinois  
LOS ANGELES • DETROIT • PHILADELPHIA

## Jack Screw Type Actuator for Aircraft

The Aircraft Actuator is a recent development of Western Gear Works, Lynwood, Cal. It is a jack screw type actuator with gear reduction, designed for operating cowl flaps, intercooler flap doors, oil cooler flaps, or similar uses. It is said to be especially suitable for high altitude operation. The device weighs 8 lbs. complete, is 5 5/16 in. high, 5 in. wide, and 18 in. long at



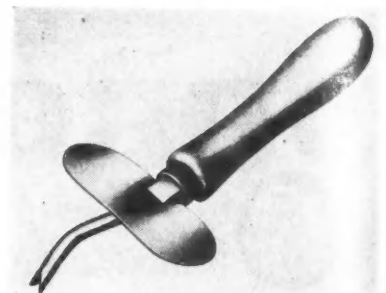
Model E-1134  
Linear Pacific  
Actuator

maximum extension. It has been tested under all conditions which might arise during its performance on a plane, and it is warranted for a tension load of 1400 lbs., compression load of 800 lbs. The unit pictured is Model E-1134, motor driven (electric or hydraulic), jack type, linear Pacific Actuator.

## Hook Scraper Has Shield

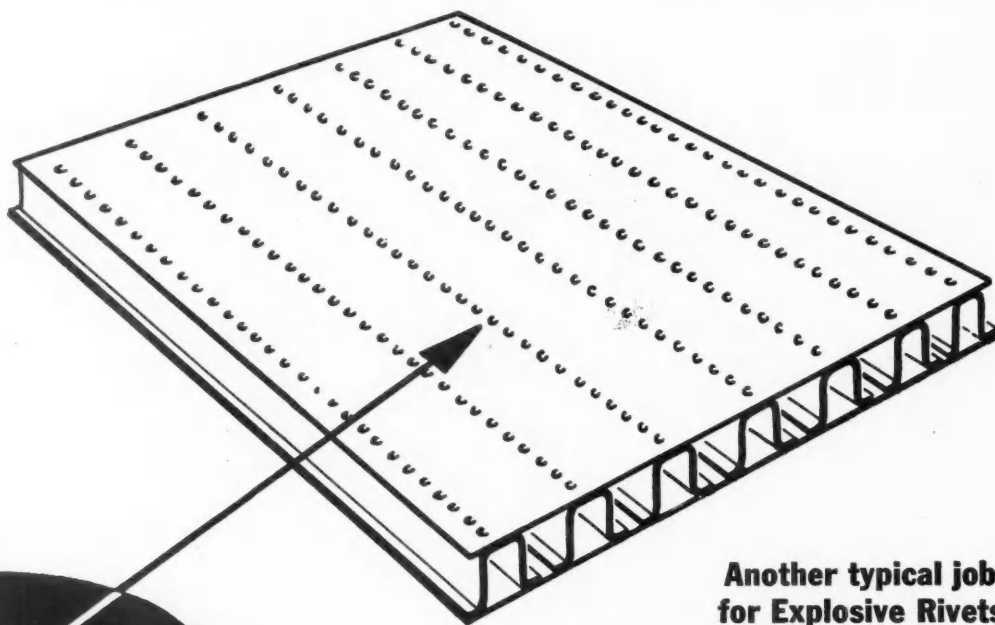
Aircraft Tools, Inc., Los Angeles, Cal., are introducing a hook scraper, with a safety hand protector-shield, for burring sheet stock. It is made in two sizes which will handle all weights of sheet stock.

An oval shield is built into the scraper where the handle joins the burring tool. When workers are hurriedly burring sheet stock and the fork slips off, this shield slides along the jagged edges, protecting fingers and hands.

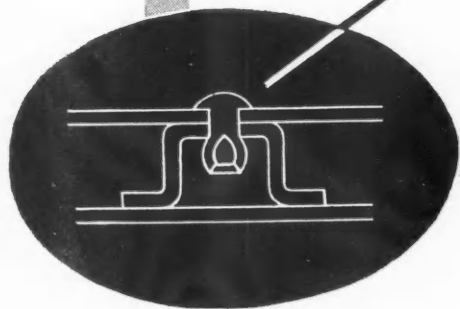


Hook Scraper made by Aircraft  
Tools, Inc.

# "ANCHORING" THE FLOOR OF A PLANE—QUICKLY



Another typical job  
for Explosive Rivets



**H**ERE'S blind riveting at high speed. When a floor skin is in position and drilled, Du Pont Explosive Rivets provide the quickest method of securing the skin to the ribs of the frame.

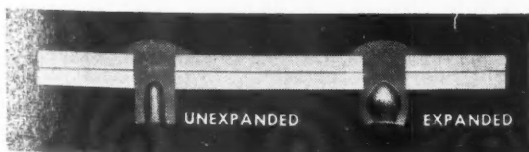
The job is simplicity itself. Alone, one operator using only one tool—a Du Pont Riveting

Iron—can readily set from 10 to 20 Explosive Rivets per minute.

One easy operation does it. The tip of the iron is applied to the rivet heads. Heat detonates a tiny charge in the end of the rivet. Expansion forms a blind head that sets the rivet securely in place. And the solid shank of the Explosive Rivet, as shown in the detail sketch, gives strength exactly where it's

needed for a trouble-free job.

Check this new, faster way of blind riveting. It speeds production, reduces costs and gives you a better job. Write for booklet, "How to Use Explosive Rivets." E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., 5494-K Nemours Bldg., Wilmington, Del.—5-236-K General Motors Bldg., Detroit, Mich.—5801-K So. Broadway, Los Angeles, Calif.



## EXPLOSIVE RIVETS

The one-piece blind fastener with a solid shank

## Reserves for Postwar Transition

(Continued from page 17)

figures. Stockholders do not get their hands on them. The profits do not represent undue enrichment of any one. Aircraft company stockholders and investors in general clearly do not consider these wartime "earnings" as real earnings. They are regarded as reserves—and highly inadequate reserves—for the transition period after the war.

The need of such reserves makes timely a few suggestions for changes in the renegotiation law which are

necessary for the protection of the aircraft industry. The industry is not asking for rewards, nor does it think anyone is entitled to a reward for his contribution to the war effort. It only asks to be left enough reserves out of the war to continue in business. The question of reserves for postwar transition is perhaps the most important single problem now confronting the aircraft industry. The problem for the industry can be well illustrated by using the figures of Consolidated Aircraft.

Its business expanded from sales of \$3,600,000 in 1939 to \$9,300,000 in 1940, to \$94,800,000 in eleven months of 1941, and to \$304,000,000 for the year ending November 30, 1942. The sales of Consolidated Vultee Aircraft Corp. for the year to November 30, 1943, are estimated at over \$650,000,000—this company representing the merger of Consolidated and Vultee effected in March of 1943. The combined sales of the two companies for the 1942 fiscal year amounted to approximately \$400,000,000.

Now the net working capital of Consolidated Vultee, after figuring suggested renegotiation settlements, amounted as of November 30, 1942, to approximately \$9,000,000. This is only about 2.25 per cent of sales in 1942. It is less than 1.5 per cent of estimated sales for the current year. *This figure of \$9,000,000 is the company's entire working capital. And it is just about equal to two weeks' payroll.*

On November 30, 1942, Consolidated alone had liabilities and commitments of \$546,000,000. Against this it had cash, receivables and inventories, and Government supply contracts covering its commitments to subcontractors and suppliers. In addition, it had its working capital of \$9,000,000. It is easy to see that this meager margin of capital to risk is a real problem.

It costs real money to build a new, big airplane. This money—"seed money", it has been called—must be available in the hands of the aircraft manufacturers if they are to continue in the business. For example, the prototype—that means the first airplane—of a 100-passenger transport would cost around \$4,000,000. The tooling to go into quantity production cost an additional \$10,000,000.

Consolidated Vultee now has 90,000 employees, of whom about 40 per cent are women. It has no thought that any such force will be needed for postwar operations. But aircraft organizations can rightfully hope to keep at least their pre-war organizations together, and to continue applying toward aircraft development the engineering brains and skills that have made this country great in the air. This will require some changes in the renegotiation law. Certainly the industry is not opposed to the objective of renegotiation in preventing excessive profits. But many of its executives do thing that the law should be amended, and the regulations revised, as follows:

1. Renegotiation should be based on net profits after taxes. And net profits not exceeding 3 per cent on sales, or whatever rate the Committee might determine, should be exempt from renegotiation.


2. Provision should be made in the Revenue Bill to allow necessary reserves for the postwar transition. These reserves should be exempt from renegotiation. In the aircraft industry such reserves are desperately needed.

3. The provision for the termination

**COLOSSUS INDUSTRIAL PRODUCTS**

**WHITE SPANISH FELT  
WHEELS & BOBS**

**For All Types of Industrial Polishing**



*Send for Free Felt Catalog* Colossus Brand White Spanish Felt Wheels and Bobs are made in a full range of diameters, thicknesses, densities and shapes to fit your specific industrial polishing requirements.

The 24 Rhodes engineer-representatives assure you quick consultation service anywhere in the United States.

Other Colossus Brand Products: Aluminide (Aluminum Oxide) . . . Dicarbo (Silicon Carbide) . . . Rouges . . . Powdered and Lump Pumice . . . complete line of Industrial Felts . . . Steel Wool . . . Sponges . . . Chamois.

New! Write now for your free illustrated Felt Catalog (contains valuable information on preservation and maintenance of felt wheels) — and literature on the Rhodes Related Finishing Line.



45 YEARS OF SERVICE TO INDUSTRY

**JAMES H. RHODES & COMPANY**

157 West Hubbard Street, Chicago 10, Illinois  
48-02 29th Street, Long Island City 1, New York





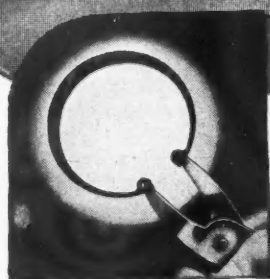
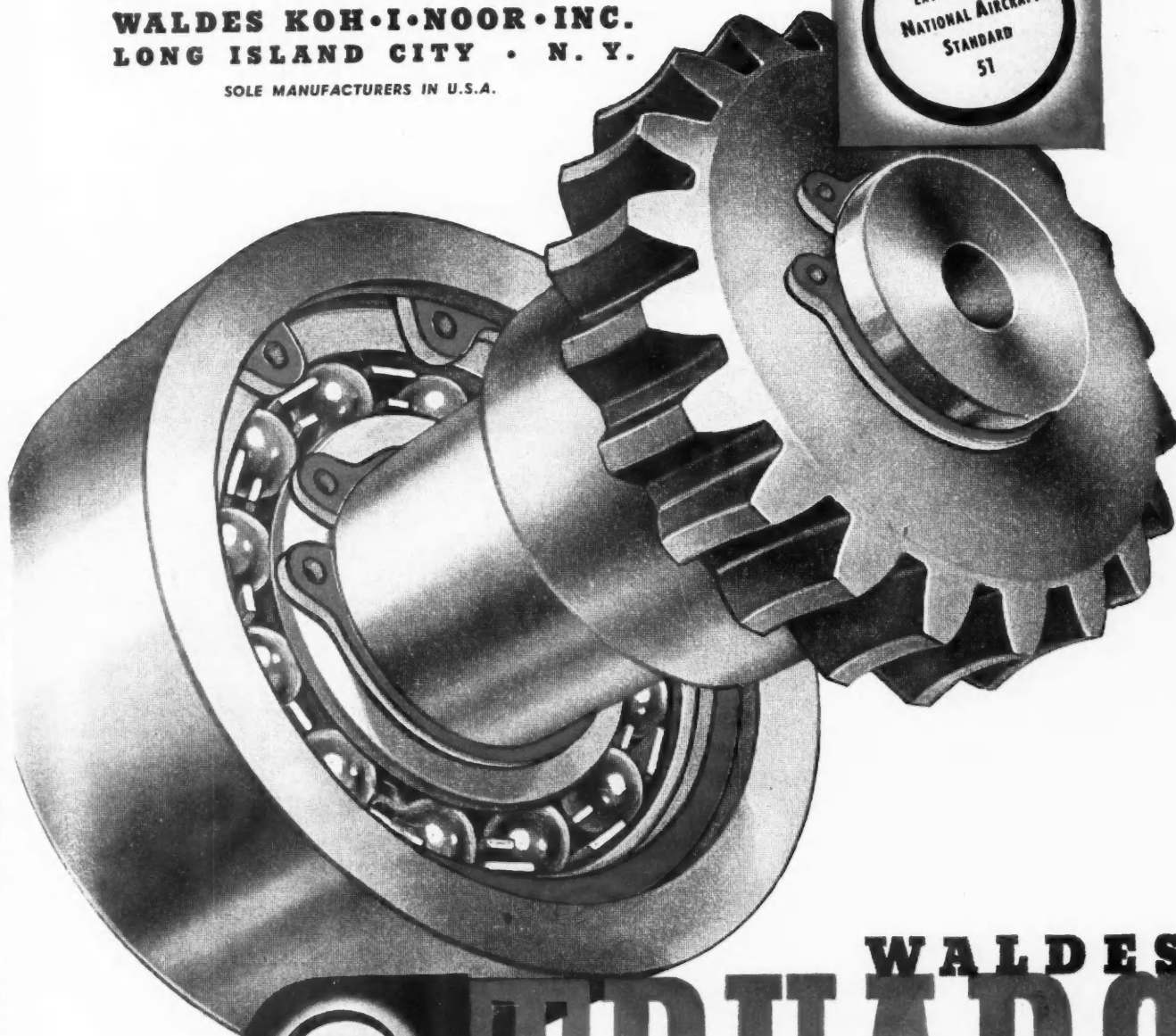
**W**ALDES TRUARC presents a significant advance in retaining rings. It spreads or contracts without distortion; always retaining its perfectly fitting circular contour.

For thrust-load fixing, and shaft and housing applications, Waldes Truarc provides distinct advantages over nuts and bolts or wedges and washers...it reduces dimension and weight...saves material...cuts manufacturing time...simplifies assembly and dis-assembly.

On request, we will gladly furnish samples and full data for your tests.

**WALDES KOH-I-NOOR-INC.**  
**LONG ISLAND CITY . N. Y.**

SOLE MANUFACTURERS IN U.S.A.



**WALDES**  
**TRUARC**  
**RETAINING RING**

U. S. PAT. REG. 18144



## First Aid FOR THE MECHANICAL WARRIORS!

Trucks, tanks, planes and jeeps are casualties too! When they're hit or hurt they must *first* be cleaned so that they can be accurately inspected to determine the extent of repairs or service required.

Kerrick Kleaners perform *first aid* for mechanized equipment by quickly and thoroughly cleaning it for the diagnosis of injuries and preparatory for the "surgery" of repairs.

The Armed Forces depend on Kerrick Kleaners for this vital part of their tremendous maintenance job. The production front here at home depends on Kerricks too... for cleaning everything from small parts to complete factories... helping to speed the output of war materials.

Kerrick Kleaners were ready for these big tasks as the result of the many years of development for automotive and industrial use.

The Kerrick Kleaner scientifically combines heat, water, detergent and friction to remove the most stubborn grease and dirt from all types of surfaces—faster, better and cheaper.

Other Clayton products serving the Armed Forces are Flash Type Steam Generators, Hydraulic Dynamometers, Hydraulic Liquid Control Valves, Boring Bar Holders and Boring Bars.



Illustrated is  
trailer-type  
Model L-OET

# CLAYTON

MANUFACTURING CO.



of contracts should be changed to give adequate protection to contractors.

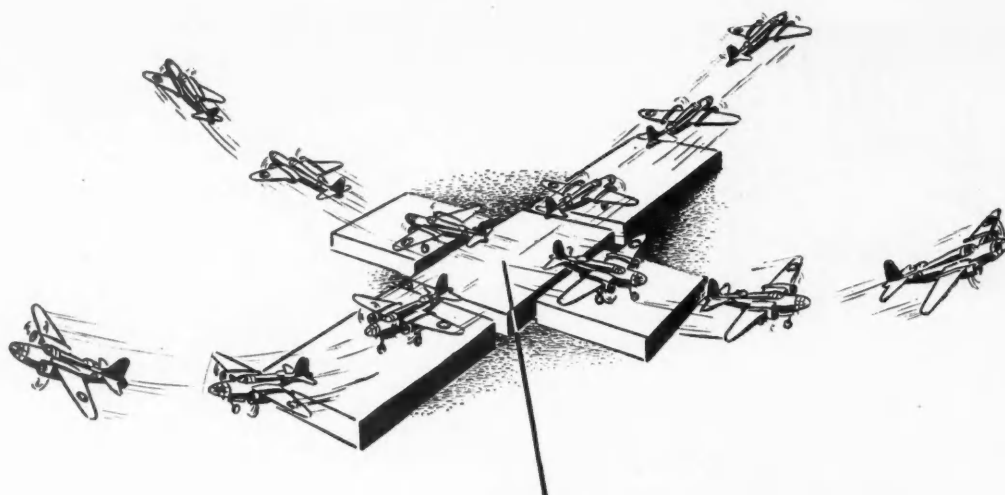
Profits after taxes are the only real profits. Profits before taxes are stage money. Taxes are an unavoidable cost, not matter how you may reduce expenses by efficient operation of a business. The law says that excessive profits are to be recaptured through renegotiation. The law does *not* say profits before taxes. But the Price Adjustment Board do their renegotiating *before* taxes, even though it would make just as much sense to compute profit before payrolls, or cost of raw materials, as to figure profit before taxes. How can a profit be identified as excessive until the profit itself is known? And how can a profit be determined until the taxes are known?

The thing that really ought to matter is what the United States Government pays for what it buys. The Government is at once the buyer and the tax collector. The taxes paid by a manufacturer, viewed from an overall cost standpoint, are actually a net reduction in the price the Government pays for his product. To illustrate, let us assume that an identical type of airplane is sold to the Government by each of two manufacturers, at a price of \$150,000. Let us also assume that this price of \$150,000 is after all renegotiation adjustments, and that the Price Adjustment Board allows each company a profit of 10 per cent before taxes.

Let us further assume that one manufacturer is an aircraft company which designed, developed, and spent its own money on the airplane. This aircraft company has a small tax base, arising from low earnings and even losses in prior years, so its profits are taxed at the 80 per cent overall limitation. Another manufacturer outside the industry would be building the plane to the aircraft company's designs and specifications, and would be benefiting by the know-how of the aircraft company. This manufacturer, we will say, has a more favorable tax base, arising from high earnings in former years, hence is taxed at an overall rate of only 50 per cent, compared with 80 per cent for the aircraft company.

Clearly, the profit before taxes for each company would be 10 per cent of \$150,000 or \$15,000. The aircraft company would pay a tax of 80 per cent, leaving 20 per cent, or \$3000 for its net profit. The other manufacturer would pay a tax of 50 per cent of \$15,000 profit, leaving it a net profit after taxes of \$7500. Now, if the price is \$150,000, and the profit before taxes \$15,000, both manufacturers' cost for the airplane would be \$135,000. But the net cost to the Government, (washing out taxes, an item going from one pocket to the other) would be the manufacturer's cost, plus the net profit he keep *after* taxes.

In the case of the aircraft manufacturer, this net cost to the Government would be \$135,000 plus \$3600, or \$138,600. In the case of the other (Turn to page 158 please)

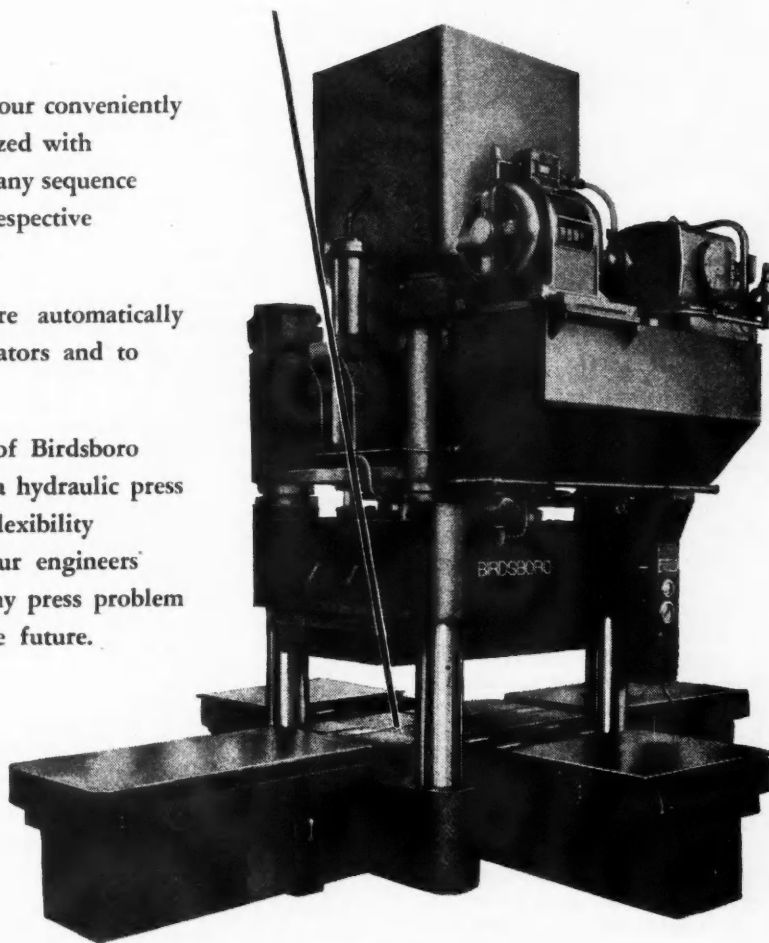


## 4 Approaches to Faster Aircraft Production

With this complete Hydraulic Press, four conveniently arranged *shuttle* tables, fully synchronized with the pressing operation can be moved in any sequence selected by operators by depressing respective start buttons in the order as needed.

All table and pressing operations are automatically controlled to minimize strain on operators and to provide the utmost in safety.

Here is another outstanding example of Birdsboro engineering ingenuity at work . . . in a hydraulic press designed to meet the volume and flexibility demands of today and tomorrow. Our engineers will be glad to work with yours on any press problem that may confront you now or in the future.



**BIRDSBORO STEEL FOUNDRY & MACHINE COMPANY • BIRDSBORO, PA.**

# BIRDSBORO

## HYDRAULIC PRESSES



## ERROR-PROOF COPIES in a *Jiffy*

Photo-exact copies for your office, shop, branch or distant plant are made fast and at low cost with A-PE-CO. One copy or a hundred in jig time — and A-PE-CO can't make mistakes. Copies directly from blueprints.



ACCURATE AS A MIRROR  
PHOTO-COPIES  
MADE FAST BY  
ANYONE — ANYTIME

**A-PE-CO "Photo exact"**

PHOTO-COPYER

**\$55.00**

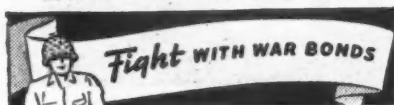
.... Non-Fading  
Photo-Copies of  
letters • documents • records •  
blueprints • pictures • drawings

Same-size copies of anything up to 18" x 22". Accepted as legal evidence. Eliminates stenotyping, tracing, proof-reading. Photo-copies direct from blueprints, graphs, tracings, telegrams, receipts, shop orders — anything written, printed, drawn, photographed. Endless uses for A-PE-CO. Needed by all departments. Big savings. Thousands in satisfactory use.

**No Camera — No Darkroom  
Low Cost**

Simple, fast. No focusing. Conserves man-hours. Any office employee quickly becomes expert. Low cost per copy, lowest investment in equipment. Saves other equipment. Put A-PE-CO on any available desk or table. Immediate delivery. Representatives in principal cities and Canada. Write for A-PE-CO folder.

AMERICAN PHOTOCOPY EQUIPMENT CO.  
Dept. BP-9  
2849 N. Clark St. Chicago 14, Illinois



## Reserves for Postwar

(Continued from page 112)

manufacturer, the cost to the Government would be 135,000 plus \$7500, or \$142,500.

In this hypothetical case, which is probably paralleled throughout industry in general, the Government would be paying \$4500 more for the very same product from one manufacturer than from the other. And one company would be making \$4500 more profit in wartime for the same service.

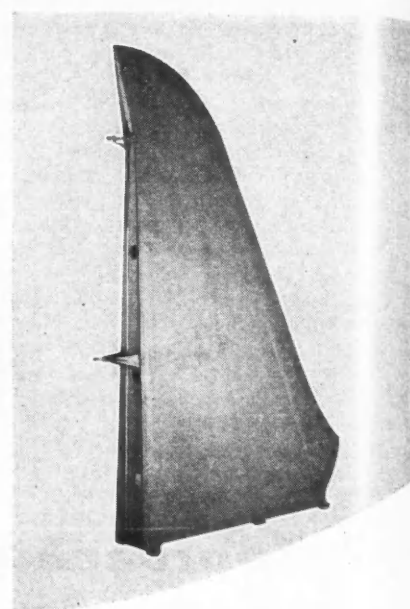
It has been said that the job of renegotiating the thousands of war contracts could be materially reduced by exempting companies doing an annual renegotiable business of \$500,000 or less. This would indeed screen out a large number of contractors, some making very high profits perhaps, and others small profits. But a fairer method of screening would be to exempt companies on the basis of profits made, rather than on the basis of the size of their business. The suggestion that profits of 3 per cent or under after taxes, or some other appropriate rate, be exempted from renegotiation would be an effective method of screening.

When it comes further to termination of contracts, it should be noted that all of the industry's present contracts with both the Army and Navy can be cancelled at any time, if the Contracting Officer deems this for the best interest of the Government. The present contracts in effect provide that expenditures up to the date of cancellation will be paid for, plus part of the profit. But a final determination under these provisions may well be a prolonged affair. And expenditures made by the contractor in all good faith might not be allowed in the settlement.

Assume even that all costs up to the date of cancellation are paid, the contracts still do not give any protection to the contractor against his real problem—that is, his operating expenses and losses after the termination date. Our industry goes on the theory—and perhaps it is wishful thinking—that its expenditures for Government account up to today are covered if a cancellation notice should be sent out tonight. Tomorrow, however, is an entirely different matter. Its operating expenses could not possibly be cut off in time to prevent enormous losses.

In the case of Consolidated Vultee, its net working capital is less than two weeks' payroll. And payroll is only one element of expense. What would it do? A drastic cut off would create chaos in the communities in which it is doing business.

Termination provisions should undoubtedly be written so that they will give every such contractor some measure of protection against loss during the period following termination. It is worth repeating that changes the industry needs are required not to protect its profits, but its future. That means the American future.



## delivery on schedule

Getting into production quickly and maintaining or bettering required shipping schedules are the rule here at MERCURY ... resulting from an experienced, skilled organization, specialized equipment and our own efficient tool department, giving a flexibility capable of speedily meeting changing requirements.

### aircraft surfaces

A large section of our plants is devoted exclusively to the producing of aircraft surfaces, both all-metal and fabric-covered—fins, rudders, ailerons and other similar assemblies — without conflict with other departments devoted to the manufacture of aluminum fuel and oil tanks, airplane parts and accessories.

*At the Cradle of Aviation*

